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ABSTRACT

This guide attempts to help teachers of American Indian students in grades 9-12 provide a culturally relevant education that takes place in the regular classroom, includes content related to Indian students' lives, makes students proud, expands to other experiences, and enhances learning. Creating sacred places means responding appropriately to students' academic, social, emotional, physical, and spiritual needs. Research has shown that to empower Indian students to learn, their school programs must incorporate their language and culture, involve parents and community as partners, provide appropriate instruction, and use appropriate testing methods. The approach presented here coordinates the teaching of various subject areas and reinforces classroom instruction with language and cultural activities by using American Indian literature as a basis for instruction. Materials and activities are aligned with challenging content standards. This guide outlines 24 thematic units, which include background information, relevant Indian literature, objectives, activities, evaluation methods, and content standards. Eight science-based units cover geology and fuel resources, care of land and animals, keeping the water supply safe, caring for water resources, caring for health, use of healing plants, abuse of alcohol and drugs, and Indian art. Eight social studies and history-based units cover tribal histories, before 1600, 1600s and 1700s, 1800-68, 1869-99, 1900-52, 1953-2000, and water rights. Eight language arts-based units cover oral tradition and oratory, Indian stories, poetry, short stories, student writing, novels, drama, and essays. American Indian and Alaska Native authors are listed. A final section lists additional resources and sources for books. (SV)

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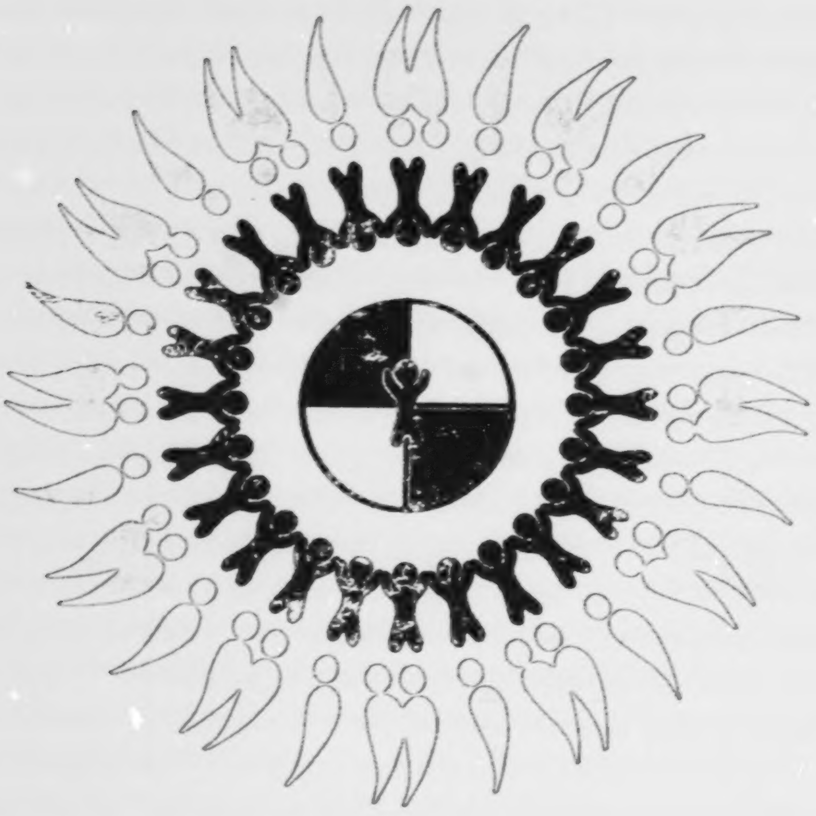

by

Sandra J. Fox D.Ed.

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RC 023684

Creating Sacred Places for Students in Grades 9-12

8 Science-Based Units
8 History/Social Studies-Based Units
8 Language Arts-Based Units

by
Sandra J. Fox D.Ed.

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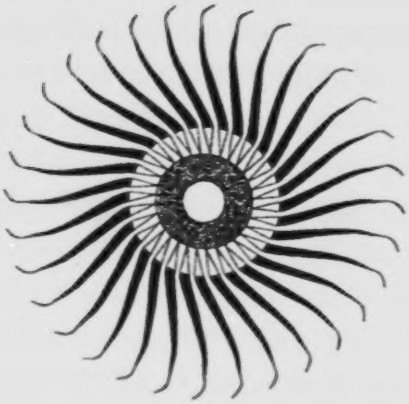

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Contents

Introduction i

Creating Sacred Places 1

Background, Materials, Activities, Standards for Science-Based Units 5
- Geology/Fuel Resources 6
- Care of Land and Animals 32
- Water 55
  - Keeping the Water Supply Safe 57
  - Caring for Water Resources 80
- Health 100
  - Caring for Health 103
  - Use of Healing Plants 116
  - Abuse of Alcohol and Drugs 133
- Indian Art 157

Background, Materials, Activities, Standards for History/Social Studies Units 183
- History/Lives of Tribal Groups 186
- Before 1600 190
- 1600's and 1700's 194
- 1800 to 1868 197
- 1869 to 1899 200
- 1900 to 1952 203
- 1953 to 2000 205
- Water Rights 208
- History Standards 219

Background, Materials, Activities for Language Arts-Based Units 237
- The Oral Tradition and Oratory 238
- Indian Stories 240
- Poetry by Indian Authors 243
- Short Stories by Indian Authors 245
- Student Writing 247
- Novels by Indian Authors 249
- Drama by Indian Authors 251
- Essays by Indian Authors 252
- Some American Indian/Alaska Native Authors 254

Language Arts and Math Standards To Be Addressed in Creating Sacred Places for Students in Grades 9-12 255
- Language Arts Standards 256
- Math Standards 260

Where to Get Books and Other Resources 265

INTRODUCTION

This book is an attempt to help teachers provide the culturally relevant curriculum that has long been the dream of Indian educators. The relevant curriculum that we have envisioned takes place in the regular classroom, includes content related to the lives of Indian children, makes them proud, expands to other experiences and enhances learning.

It used to be that there was limited funding available to develop culturally relevant curricula, and some materials were developed. Few of those materials are still available, and the funding has all but disappeared. There is a renewed interest in the dream, however, and now Indian literature is a resource that can provide the basis for a comprehensive culturally relevant curriculum. There are many more Indian authors writing books for children and more good Indian literature is being published.

This document provides teachers with background, materials (Indian literature), and activities for 24 units: eight are science-based thematic units, eight are social studies/history-based, and eight are language arts thematic units, all for students in grades 9-12. They are aligned with new, required science, social studies/history, language arts and mathematics content standards so that teachers are teaching what is expected of them and, at the same time, are making instruction more meaningful to the students. The units are to be taught in a multidisciplinary approach. This approach promotes close coordination and cooperation of regular teachers with each other and with cultural instruction teachers and their work. This is not a canned curriculum; it contains the ingredients necessary for a school to develop its own culturally-based curriculum for the high school level.

This document also pays tribute to many: Indian and other authors who write books for and about Indians, Indian and other organizations that distribute books by and about Indians, Indian and other organizations that have made the improvement of teaching Indian children their aim, and teachers who have developed and implemented culturally-based curricula in their classrooms.

Some of the materials and activities included here have been taken from the work of others. Some of the math and science activities included were developed by teachers of Indian students at summer workshops at Haskell Indian Nations University taking place from 1992-1994 or at the University of Kansas by teachers in the MASTERS (Math and Science Teachers for Reservation Schools) Project. Other science materials are from the Science Learning Center at Northern Arizona University.

I have not read every book listed in this document, and if I did, I would not be able to guarantee their being free of cultural bias or inaccuracies. I did utilize the publication *Through Indian Eyes: The Native Experience in Books for Children* by Beverly Slapin and Doris Seale to avoid books that may be offensive. I tried to promote books written by Indian authors. I recommend that sometimes books should be reviewed by local Indian people to be sure they are appropriate, especially if they are about their tribe(s). If it is found that a book is not acceptable to Indian people or to a tribe, especially, the book should definitely not be used. There is guidance for reviewing books and curriculum materials in *Through Indian Eyes* and in a document developed by the Indian Community School of Milwaukee listed in the last section of this book. If the use of the approach outlined in this document works, it should promote a resurgence of local storytelling and/or the writing of more children's books by Indian people.

The development of this document is part of an effort of the National Indian School Board Association to provide an Indian model of school reform that includes the Effective Schools framework with several enhancements: tribal values and organizational culture; wellness, healing and prevention strategies; leadership based on vision, wisdom and courage; the Learning Record performance-based assessment system; and the integration of Indian curriculum.

It is hoped that this document will be useful to parents, tutors, teachers, aides, administrators and school board members at schools where there are Indian students. I hope that Title IX and Johnson O'Malley programs can utilize it. I hope that parents who are homeschooling their children will find it helpful. I hope that teachers of nonIndian students will use it.

Most of all, I hope this document will help students somewhere. I greatly enjoyed developing it. I hope others will find it useful as they strive to create sacred places for Indian young people.

-SJF, Oglala Lakota, Albuquerque, NM

CREATING SACRED PLACES

Creating Sacred Places means responding appropriately to students' academic, social, emotional, physical and spiritual needs. This document addresses improving the teaching of Indian students and empowering them to learn by addressing these needs. The research is quite clear on the matter. If Indian students are to be empowered to learn, their school programs must include four characteristics (Cummins, The Empowerment of Indian Students):

1. **Language and culture must be incorporated into the school program.**

Considerable research suggests that for minority groups experiencing school failure, the extent to which students' language and culture are incorporated into the school program constitutes a significant predictor of academic success. Educators who see their role as encouraging their students to add a second language and culture to supplement rather than supplant their native language and culture are more likely to create conditions in which students can develop a sense of empowerment. Educators who see their role as getting their students to replace their home language and culture with English and white values in order to assimilate them into the dominant culture are more likely to create the conditions for student failure. Students who develop skills in two languages have been found to have learning advantages over students who have only one language.

2. **There must be an unbreakable bond between school and community.**

When educators involve parents as partners in their children's education, parents communicate to their children a positive attitude toward education that leads to improvement in the students' academic achievement. Teachers operate along a continuum from collaborative to exclusionary. Teachers with a collaborative orientation work closely with teachers or aides fluent in the student's first language and/or knowledgeable of the community in order to learn from them how to communicate effectively with parents. Teachers with an exclusionary orientation tend to regard teaching as their job and are likely to view collaboration with parents as either irrelevant or actually detrimental to children's progress. Students can become empowered only when education becomes a true community enterprise involving an equal partnership between educators at school and educators in the home, the children's families. In addition, the collective experience of the community must be used as the context for all learning in the school.

3. **Appropriate instruction must be provided.**

Research indicates that the learning difficulties of minority students are often caused by the way we teach them. These students frequently receive intensive instruction that confines them to a passive role and induces a form of "learned helplessness." This kind of instruction follows the transmission model in which it is the task of the teachers to impart knowledge or skills they possess to their students who do not yet have these skills. The teachers initiate and control the interaction, constantly orienting it toward the achievement of instructional objectives. In contrast, the experiential-interactive model of instruction focuses on giving students hands-on classroom experiences that provide students with a basis for understanding more abstract academic curricula. The interactive model also incorporates what we know about the relation between language and learning and promotes language-rich classrooms. The transmission model entails the suppression of students' experiences. The experiential-interactive model entails an additive orientation toward students' cultures and languages, an openness to collaborate with community resource persons, and active use of written and oral language skills. Learning styles of students must also be taken into account.

4. **Appropriate testing must be used.**

Classroom and psychological testing have disempowered and disabled minority students. Minority students are overrepresented in special education because of improper testing. To challenge the disabling of minority students, assessments must focus on the extent to which children's language and culture are incorporated within the school program, the extent to which educators collaborate with parents as partners in a shared enterprise, and the extent to which children are encouraged to use language (both tribal and English) actively within the classroom. In other words, the primary focus should be on remediating the educational interactions that Indian children experience. Further, it is being recognized that, while formal testing has a role to play, its impact is considerably greater when combined with classroom assessment. The longitudinal observation and monitoring of student progress throughout the school year by classroom teachers yields valuable data and is much more accurate and fair than formal testing, thus the present emphasis on performance-based assessment.

These four characteristics that address needs of Indian students must be considered carefully by every school seeking to educate Indian learners. Consider this quote from Ron Edmonds of the Effective Schools movement:

> We can, whenever and wherever we choose, successfully teach all children whose schooling is of interest to us. We already know more than we need to do that. Whether or not we do it must finally depend on how we feel about the fact that we haven't so far.

We are at a time when it is being demanded that schools produce higher achievement. Students must learn to read and write at higher levels, they must be able to solve more difficult math and science problems, they must be adequately prepared to meet the world and function successfully in the 21st Century. We must change the way we do things in order to produce these results. Schools have been failing students. Part of the problem is that we don't do what we know should be done, as Ron Edmonds states. We don't listen to what the research says.

Schools are involved in various school reform activities at this time. Teachers are being asked to do many things including:

> align curriculum with the new content standards and new assessments,
>
> do a better job of teaching reading, writing and math,
>
> utilize an integrated approach to teaching the various content areas,
>
> teach for understanding and application and focus on depth,
>
> teach disabled and gifted students in the regular classroom,
>
> promote positive student behavior through a school-wide approach, and
>
> provide meaningful parental involvement in the instructional process.

In addition, teachers of American Indian students are asked to:

> incorporate American Indian content standards,
>
> provide instruction for Indian students that is based upon research,
>
> provide culturally relevant instruction within the regular classroom, and
>
> promote the use of native languages to strengthen student's language ability.

This is only a partial list of the many things that teachers have to do. This document will provide assistance to teachers who really want to create sacred places for students and will help coordinate all that they have to do.

Essentially, the approach presented here promotes coordinating the teaching of various subject areas and reinforces classroom instruction with language and cultural activities by utilizing American Indian literature as a basis for instruction. The materials and activities are aligned with the new, more challenging science, social studies/history, language arts and math content standards and American Indian content standards for each area.

To use the approach recommended by this book, teachers must –

1. Work closely with the cultural instructors at the school or in the community. The regular teacher and the cultural instructor could team teach these units. If not, the cultural instructor must provide input to the regular teacher to help integrate culture into the regular classroom. A less effective approach would be that both the regular teacher and the cultural instructor teach the same topic, but separately. The science units provide good language immersion topics for teaching the native language while reinforcing classroom instruction. This would also be ideal.

2. Decide what units to teach and what order to teach them in. If all the science, English and social studies teachers in the high school are using this book, they may want to determine which units or parts of the units each one will use. If you are the only teacher in those grades using this book, you may want to use all of the units in your teaching area(s) or only some of them. You should align them with what you are already teaching. You should collaborate with other teachers. For example, if a history teacher is teaching a certain period of time, the English teacher could utilize a piece of Indian literature that relates to that time, the cultural studies teacher can provide the local history relating to that period of time, etc.

3. Decide what literature and activities to use. Of course, literature that deals with the local tribe(s) is best. You will want a variety of levels of literature to reach various students in your classroom. The example activities included can be adapted to your own tribe(s) and to the grade level you teach. Include your own ideas for additional materials and activities. Work closely with your librarian.

4. Align the McREL standards with your own content standards. The standards included were developed by the Mid-Continent Regional Educational Lab (McREL) and summarize all the state standards. You will want to cross check them with the content standards your school has chosen to follow. Review the standards provided in this book to give you ideas for further activities and more cultural information. The language arts and math standards cover all the units.

5. Plan a parental involvement strategy. Let the parents know what are studying. They will be interested in these topics and will then be more supportive of their students' learning. Provide activities that involve parents and grandparents such as interviewing them about certain periods of history, their knowledge of the uses of plants, etc.

6. Utilize good teaching strategies. Continue to utilize cooperative learning, have students read widely, use literature circles where various students are assigned to formulate questions for the reading, find interesting parts, etc. Many of the suggested activities are based on constructivism or project-based learning. Use a form of performance-based assessment to track student progress.

- BACKGROUND
- MATERIALS
- ACTIVITIES
- STANDARDS

for Science-Based Units

GEOLOGY/FUEL RESOURCES

Geology is a field of science that directly affects American Indian people. It is the study of earth and rock formations and resources found in the earth. Resources such as coal, oil and gas are sources of energy that have contributed to more convenient lifestyles for American Indians and others. But they have also contributed to destruction. Many tribes and tribal members have received money for coal, oil and gas found on their lands, but it is usually not without a price. Land is destroyed and sometimes lives have been destroyed. The Osage Tribe in Oklahoma was particularly devastated by the discovery of oil on their lands.

LITERATURE FOR GEOLOGY/FUEL RESOURCES UNIT -

Morning Star, Black Sun, Northern Cheyenne Indians and America's Energy Crisis by Brent Ashabranner, Dodd, Mead, 1982.

Mean Spirit by Linda Hogan (**Indian Author**), Ivy, 1990. About the Osage.

Sundown by John Joseph Mathews (**Indian Author**), University of Oklahoma Press, 1988. About the Osage.

Wolfsong by Louis Owens (**Indian Author**), West End Press, 1991. About open-pit mining.

The Invasion of Indian Country in the Twentieth Century: American Capitalism and Tribal Resources by Donald L. Fixico (**Indian Author**), University Press of Colorado.

Ecocide of Native America: Environmental Destruction of Indian Lands and Peoples by Donald A. Grinde, Jr. and Bruce E. Johansen.

Section on Indian land in Our Brother's Keeper: The Indian in White America ed. by Edgar S. Cahn, A New Community Press Book, 1969.

Red Ribbons for Emma by New Mexico People & Energy Collective, New Seed Press, 1981.

All Our Relations: Native Struggles for Land and Life by Winona LaDuke (**Indian Author**), 1999.

ACTIVITIES FOR UNIT –

1. Have the students learn about coal, oil and gas, the mining and drilling and uses of these natural resources, read cultural materials and hear cultural perspectives relating to this topic, and observe related impacts.

2. Have the students do research papers on the use of products from coal, oil and gas in their area/reservation. What are the effects? Are there any negative effects? Are these products being used efficiently and conservatively?

3. Have the students read about how the discovery of oil and gas affected the Osage Tribe of Oklahoma and about other exploitations of fuel resources on Indian lands.

4. Does the local tribe(s) have coal, oil and/or gas resources? Have the students do research to find out what the status is of the use of these resources? What is the rate of production? How has this affected the land and lives of the tribal members? List positive and negative effects. Have the students summarize their findings in written reports.

5. Discuss the reasons for the fluctuation of oil and gas costs. What do oil and gas cost now? Why are these natural resources especially sought?

6. How is mathematics utilized in the coal, oil and gas industries? Develop some problems and solve them.

7. Have students observe a meeting of the natural resources committee of the tribal council. Have the class prepare questions and then invite a member of the committee to their class to answer questions the class may have.

8. Have the class draw conclusions from their study of geology/fuel resources and make a power point presentation to others about the topic.

Following are materials and example activities developed by teachers of Indian students who attended the MASTERS project at the University of Kansas and a math and science workshop at Haskell Indian Nations University. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities.

Pierce Harrison

by Wally C. Strong

Mr. Harrison is employed with the Bureau of Indian Affairs (BIA), Yakima Indian Agency, Toppenish, Washington, as a Supervisory Highway Engineer. He has been employed with the BIA for the past 17 years. He received a Bachelor of Science degree in Civil Engineering from Washington State University, Pullman, Washington in 1974. Civil Engineering is the branch of engineering that involves the planning and supervision of such large scale construction projects as bridges, dams, tunnels and highways. How did Pierce decide on a career in Engineering?

In reminiscing about preparation for his career he looks back at high school. "I never had any problems with math, I liked chemistry, I was good in chemistry. I didn't know what Engineering was. I wanted to work on heavy equipment. I heard some people talk about the 'big bucks' to be made in heavy equipment." Since civil engineers have to understand the use of cranes, bulldozers, power shovels and other heavy construction equipment, Pierce's interests and the requirements for a civil engineering degree dovetailed.

After high school Pierce was drafted into the Army. Upon completion of basic training he was shipped to Heavy Equipment Mechanic School. Next he was sent to Vietnam for two years and spent a tour of duty as a door gunner in a helicopter.

Upon receiving an Honorable Discharge from the Army he used his military schooling in Heavy Equipment to land a job with the State of Washington Highway Department, where he drove a snowplow on the highway through the Cascade Mountains on Snoqualmie Pass. His next job was on the Yakima Indian Reservation in Central Washington. He was hired by the Bureau of Reclamation as a Crane Operator/Oiler. In looking toward the future this job was top of the line; it was also a dead end for Pierce though. It was during his employment at the Bureau of Reclamation that he met his wife Linda. They decided that it would be in the best of both of their personal and career interests to return to college. So, they returned to college. Pierce studied for a degree in Engineering and Linda a Master's degree in Community College Administration - she already had a B.A. in Secondary Education. Their son, Pierce III, "Sonny" was born in the Washington State University college town of Pullman.

"Yes, we have our son, Sonny - he is quite active in a lot of things - has his special hobbies and sports, especially racquetball." Pierce, Sr. is proud of his son's capabilities. When asked if he is inspired by his family, he replies: "I never grew up or lived on an Indian Reservation. My father was employed off the Reservation. I think about my son," he reflects, "being able to go to school, make friends, attend traditional Native American get-togethers. I don't regret coming here. In fact, I will probably stay put, in my job, until our son graduates from high school. My wife Linda is employed at the Yakima Nation Cultural Center as a Manager of the Restaurant Enterprise, so we have our roots set for a while. Maybe later I will retire. I now have 17 years with the Bureau (BIA) and I'm thinking about getting a degree in Management, because we work with many contracts and there is a lot of legal contractual language to interpret."

"So much to consider," Pierce ponders and returns to the original question of family inspiration. "I play racquetball, but Sonny is a good racquetball player. I'm a B player, my son is an A player. He is good enough for national competition. I put everything into helping our son."

Are you inspired by what you do, your career choice as a Supervisory Highway Engineer? "When I was a senior at Washington State University I was recruited quite a bit," he recalls. "I narrowed my choices outside the Yakima Reservation to Standard Oil in San Francisco and Hercules Corporation in Utah. Although these were good long term prospects and offered good job security," he recalls, "I debated deep in my mind whether it was a mere minority tokenism offer. They would be hiring me because I was Native American and it would fulfill their minority affirmative action quota."

"I ended up moving with my family back to the Yakima Indian Reservation. I had no job lined up, but I wasn't worried. I applied to the Bureau of Indian Affairs and was soon hired as an Engineer Technician at the Yakima Indian Agency, Toppenish, Washington. I have been here 17 years, and I enjoy living and working here. As I stated earlier I don't regret coming here."

What is your work schedule? "I'm on the supervisory level, out in the field about 10% of the time. Some days I observe the Maintenance Crew who repair and resurface the roads. The Maintenance Crew also takes care of the roadsides, shoulders and bridges. They are responsible for snow and ice removal, putting up road signs and painting the road stripes. On other days I observe the Construction Crew, who clear the land and actually build the roads. Building roads first requires clearing the right of way of trees, stumps and other materials and relocating any buildings that must be moved. The next step is grading the road which means evening it out by leveling the hills and filling in the valleys. Next a foundation is laid and finally the road is surfaced.

Besides the Bureau of Indian Affairs' roads, there are also the Yakima Nation Tribal Roads to maintain, roads to traditional areas, food gathering, cemeteries, long houses, churches. Sometimes we're caught in the tribal traditional political flack of maintaining the natural land area.

"It is ironic that those with the common sense view of roads for the future are the elder people of the Tribe. They recall that the roads were for horses and wagons. The old people say, 'Today we have automobiles, trucks, that take us to our traditional areas. We need the roads built and maintained.' It is a question of how long the Reservation Closed Area is going to remain closed to non-tribal members.

"We have short term and long term projects. A short term project may take a day or five years and include building such structures as bridges, manholes, culverts, and detours."

"A long term project may be in the planning, approval and construction stage for 20-30 years. It depends on budgets, research, land use planning, who will be delegated to do the work, what kind of design, and what level of need it has. We need tribal members' input, Tribal Council Roads Committee approval and either Tribal or Bureau of Indian Affairs' appropriation of funds. This can all get quite involved and technical," Pierce asserts. "Especially trying to set up the long-term planning. We try to set up a yearly plan in August and September complete with budgets, but the budgets are constantly being upset. In the future the roads system will be incorporated into Land Use Planning."

A degree in Civil Engineering requires many different science courses. One course that Pierce took was Engineering Geology. A highway engineer needs to be able to identify the kind of rock that one will be blasting into to construct a culvert or a bridge abutment. There are just three basic rock types: igneous, metamorphic and sedimentary. Igneous rock is volcanic in origin and it is this kind of rock that if found primarily at the surface on the Yakima reservation. Sedimentary rock is an aggregate rock made of fragments of other rock deposited by wind or water or material precipitated from solutions. Metamorphic rock is rock that has been changed by temperature or pressure. The different rock types require different types of machinery and different periods of time for removal. Different rock types are more susceptible to sliding or are not good for compacting. For Pierce's job it is essential that he have this kind of information.

Pierce also tooks a soils course which helps him make the many day to day decisions that must be made. For road construction, if the soil is not naturally firm then it must be leveled off and packed by heavy machines. The base must be sufficient to support the surface and to keep out moisture. Pierce does a lot of soil testing and is especially interested in drainage patterns. He may have to make the decision about whether to add lime or fly ash to stabilize or harden the soil.

For the future Pierce states: "It is hard to say whether the Reservation will remain closed or decide to pursue, plan, design, and research development enterprises where good roads are needed. A ski resort has been proposed, but the question is, do the tribal members want development, which would bring jobs, or do they want to keep a closed and traditional natural land area?"

"It is quite an interesting job," Pierce contends. "I am responsible for planning the roads. I have to know where the people live, where they want to go and how they want to get there. I also need to know what products need to be brought to the reservation and where the users are. Traffic counts help me figure out how many, when and what kind of vehicles use the reservation roads. Public input is essential though and that's why planning is such a long process."

Looking ahead to his own future Pierce says, "I will retire in a few years, maybe return to school to get an MBA (Management Business Administration) degree and start my personal consultantship business. The things planned during my tenure as an Engineer will continue with those that step into my job."

Sitting in his office, Pierce wears his hair in traditional long braids and dresses in a way in which he is comfortable, out in the field or in the office. He chuckles and states, "If someone wants something bad enough they can get it. It's just a matter of applying oneself. Once while in college I hit an all time low, academically on probation, but I also climbed to the top academically - Dean's List, 4.0. So just hang in there - want it bad!"

ACTIVITIES

1. Have students do research and write papers on various kinds of engineering professions.
2. Have the class write letters to the American Indian Science and Engineering Society, the Bureau of Indian Affairs, and/or to the local tribe(s) asking what kinds of engineers are being sought.
3. If there are Indian engineers or engineer technicians in the area, have the class write to them and invite them to make a presentation to the class about their jobs.
4. Have the class write papers comparing the political issues and concerns around whether to open the reservation to expand economic development or to keep it more closed to such.

SCIENCE/MATH -

"Energy is Where You Find It"

CURRICULUM AREAS: Science
Math
Social Science
Language Arts
Art

TIME FRAME: 2-3 Weeks

DESIRED LEARNING OBJECTIVES

Students will:

1. Investigate the positive and negative impact of the fossil fuel industries upon the students' lifestyles, their environment, and tribal economics
2. Construct and illustrate the geological time scale
3. Collect and interpret data relating to the fossil fuel industries
4. Research issues concerning Native Americans, regarding the production and use of fossil fuels
5. Identify and/or define pertinent vocabulary and abbreviations
6. Construct and assemble a portfolio of all materials developed in the unit to include one written request for additional information on a subject of his/her interest relevant to fossil fuels.

TEACHER'S BACKGROUND INFORMATION:

Among Native American people, there are many stories that reflect the values and beliefs of Native people about natural resources that are found within Mother Earth. The Nisqually of the Pacific Northwest tell the tale of Loo-Wit, the Fire Keeper (adapted from Keeper's of the Fire):

The teacher needs to inform students that they will be graded on a portfolio that will be prepared in this unit.

Use this vocabulary list in conjunction with the "Fossil Energy Glossary" on p. 14 of Dinosaurs and Power Plants.

BIA-Bureau of Indian Affairs
BLM-Bureau of Land Management
SCS-Soil Conservation Service
USGS-United States Geological Survey
petrochemical
petroleum
geology
fossil fuels
injection well
artisan well
Bureau of Reclamation
renewal resources
non-renewal resources

ACTIVITY ONE: DISCUSSION

Relate to the students the legend of Loo-Wit as summarized in the Background Information. This story emphasizes the importance of treating Mother Earth with respect as demonstrated by the quotation at the end of the summary. The students need to be able to identify, define, and distinguish between renewable and non-renewable resources. Bring pictures, examples, models, etc. to class.

Compare the way of life before the fossil fuel industries began with modern day life. Ask "What does the need for fossil fuels do to the land?".

Have the students to research issues of concern to them and their people regarding the environmental impact the fossil fuel industries have had upon their lands. What are the ramifications to the land of strip mining, coal burning, power plants, and drilling for both oil and gas. How can these desecrations be corrected?

ACTIVITY TWO: INTRODUCTION

Introduce and familiarize the students with the unit vocabulary and the abbreviations used for the various organizations.

Have a display of various "Petrochemical Products"(see list, background information.) Ask, "What do these products have in common?" Have students generate reasons why the study of fossil fuels is important. Students should brainstorm in

In the beginning, The Creator was very generous and gave two tribes, the Klickitats and Multnomahs, everything they could ever want. The people were greedy, however, always coveting whatever the other had. When The Creator saw this, He took fire away from them. When the people became cold and miserable, they begged to have fire back. An old woman named Loo-Wit was the only one who had fire left. The creator said "if you will share your fire will all the people, I will give you whatever you wish. Tell me what you want". "I want to be young and beautiful, said Loo-Wit" and so it was. Loo-Wit was instructed to "keep the fire burning to remind people that their hearts must stay good and to give the fire to those who made up their quarrels".

When the chief of the Klickitat and the chief of the Multnomahs came to Loo-Wit's fire, and saw how beautiful she was; they both wanted to marry her and began to quarrel and fight again. This made the Creator so angry that the chief of the Klickitats was changed into Mount Adams and the chief of the Multnomahs into Mount Hood.

"Loo-Wit was heartbroken over the pain caused by her beauty and no longer wanted to be a beautiful young woman. She could no longer find peace as a human being" and so the Creator changed her into the most beautiful of all mountains, Mount St. Helens, which stands to this day between the other two mountains. "...it was intended that humans, too, should look at her beauty and remember...to share the land and treat it well. If we human beings do not treat the land with respect, the people said, Loo-Wit will wake up and let us know how unhappy she and the Creator have become again. So they said long before the day in the 1980s when Mount St. Helens woke again." (Summarized from Keeper's of the Earth, pp. 41 and 43).

The values and beliefs reflected in this story contribute to our understanding of the world view of Native Americans. Balancing these ways of understanding and living life with knowledge of natural resources is important for Native people as they work towards self-sufficiency for their tribes.

Native American students should investigate the growing global concern about the use of fossil fuels and the economic and environmental impact the fossil fuel industries have upon the students' tribes and tribal lands, as well as upon society as a whole.

Reference materials from the BIA, BLM, MMS (see vocabulary list), and the Department of Energy are available for background information and student use. Please review them before beginning the activities in this unit. Also, make a copy of the sixteen page booklet, "Dinosaurs and Power Plants" for each student.

small groups, compare lists, and make a unified class list. The teacher reads "Why Should We Study Oil and Gas"(background information).

Show the video: "Producing Oil" (contact the Bureau of Land Management at (202) 208 - 5717). Have a summary discussion and ask once again why we should study fossil fuels.

ACTIVITY THREE: HISTORY

Have the students read pages 1 and 3 of their booklet, "Dinosaurs and Power Plants. Give them a copy of the the geological time scale. As a group, the students will total the years on the time line and calculate the scale to be used. Give each pair of students a sufficient length of adding machine tape on which they can construct and illustrate the geological time scale using pictures appropriate to each era. They should measure using the metric system. Display the time lines in the classroom or hallway, letting them compare with each other. Now is a good time, as a precursor to the next activity, to discuss the origin of fossil fuels and how they came to be trapped in the earth.

ACTIVITY FOUR: DRILLING AND WILDCATTING

Have the students read pages 4, 9, and 10 in their booklets, "Dinosaurs and Power Plants". These pages deal with the fossil fuels, coal, gas, and oil.In this activity, the students will take "core samples" from the earth. To simulate strata, have the students layer bread, peanut butter, jelly, and cheese. The peanut butter represents the oil and the cheese is the shale underneath which the oil is trapped. The students can then take core samples by inserting a clear drinking straw. Contact an oil company for a real core sample.

Oil is where you find it. Students can also "wildcat" for oil. To set up this activity, spread peanut butter on several slices of bread in selected spots, then turn the bread over on butcher paper. Students randomly drill for oil(peanut butter) by inserting straws. This is a good place to discuss the economics, costs, and risks involved in drilling for oil.

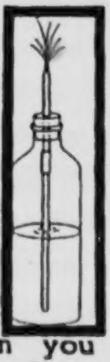
ACTIVITY FIVE: OIL WELLS

Have the students examine pictures of oil derricks and oil wells. The students should construct their oil derricks larger than soda bottles so that one of the two oil wells below will fit in their oil derrick.

The two types of oil wells here are taken from activities in the book, 700 Science Experiments-

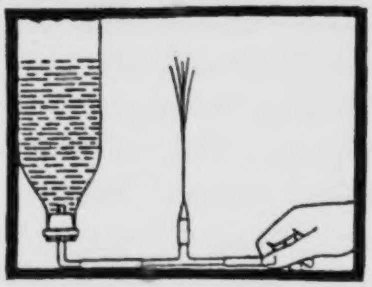
1. Making a 'gusher' with compressed air:

   Secure a large narrow-necked bottle such as is used for soda water. Place a one-hole stopper in the bottle. Through the stopper, put a 10cm length of glass tube which has been drawn to a jet on the outside end. With a short length of rubber tube, attach a length of glass tube that will extend nearly to the bottom of the bottle. Fill the bottle about half full of water. Insert the stopper firmly and hold it in with your fingers. Next, blow hard into the bottle and when you release the pressure, point the bottle away from you. What happens? (#2, p. 85).



2. The model of a hydraulic ram (#15, p. 107-8) can be adapted to represent an injection well. Since oil is lighter than water, injection wells are often drilled to force oil up through the oil well by injecting water down under the oil.

   Secure a soda water bottle from which the bottom has been removed. Fit the bottle with a one-hole rubber stopper carrying a short length of glass tubing. Connect this to a glass or metal T-tube which has a piece of rubber tubing on one end and a jet tube connected to it with a rubber tube as shown in the diagram. Fill the bottle with water and pinch the tube at the end. Let the water run from the end of the tube. Stop the flow suddenly by quickly pinching the tube and note the height to which the water squirts from the jet tube. Let the water flow and stop alternately.



ACTIVITY SIX:

The Burnham Chapter is a Navajo community located on the border of NE Arizona and NW New Mexico. It is presently a coal mining area, although previously uranium, coal, and gas were mined or produced there. Have groups of students read the "Burnham Resistance" article to answer these questions.

1. What benefits were the Navajo promised for the removal of these natural resources from the land?

2. What were the threats to the Navajo people and Mother Earth?

3. Why were the Navajo people opposed to removal of these resources?

The last date mentioned in the article is 1981. Call or write the Burnham Support Group for an update on their progress to stop the desecration of Mother Earth for one's own benefit.

Research and report on other areas having similar problems.

ACTIVITY SEVEN - STATISTICS

The students will make posters to present statistical information. For example, a poster which shows how a 42 gallon barrel of crude oil is used for petroleum products can be made. Use the information sheet from the background information packet which shows how 100% of the crude oil is used. Students draw a large picture of a barrel (one meter high). Metric measurement can be used. Each whole percent will equal one centimeter and each tenth of a percent will be represented by one millimeter. Therefore, one meter will equal 100% and 9cm 8mm will equal 9.8% .

Each group of students should come up with a different set of statistical information that could be represented by line graphs, bar graphs, circle graphs, etc. It is interesting to compare populations of countries with the amount of oil they consume and produce, for example.

ACTIVITY EIGHT: TRANSPORTATION AND OIL SPILLS

Generate a discussion about the desecration of tribal lands. Refer to the article titled "Burnham Resistance" in the teacher background information materials.

Have the students read page 11 and complete the activity on page 16 of "Dinosaurs and Power Plants."
Then they will do the "Oil Spill!" activities.
This activity is taken from Earth Notes (Fall, 1991)
U.S. Environmental Protection Agency
401 M Street, S.W. (A-107)
Washington, DC 20460

OIL SPILL!

Nature begins to clean up the moment an oil spill occurs. The oil separates into heavier and lighter parts which are spread by winds and currents. Some of it evaporates and some of it is consumed by bacteria called "petrophiles." For many reasons, however, people grow impatient with these slow natural processes. Success in cleaning up oil spilled in a lake or ocean depends upon human preparedness and rapid action.
Using common household supplies, teams of students can test their skills during a miniature environmental disaster. To begin, you will need water and 10ml of vegetable oil. Also give each group of students a set of the following materials: an aluminum pie pan or empty butter tub, 25cm sections of twine, a handful of sand, paper towels, liquid detergent, an eye dropper, and newspaper. Have the students cover their work surface with the newspaper.

As you fill each pie pan with water, explain that an oil tanker has just sprung a leak on each "lake" and it is each team's responsibility to clean up the pollution with minimal damage to the environment. Describe the various techniques which are available to them. These include containment, using a circle of twine; recovery, using the eye dropper; removal by sinking, using the sand; removal by absorption, using the paper towels; and dispersal, using the detergent. Allow groups a few minutes to plan their strategy, then add 2 drops of oil to their water and let them begin.

Once everyone is finished, discuss the advantages and disadvantages of each method, drawing on the students' experiences. What techniques were used to clean up the Exxon Valdez spill in Alaska? Was that effort successful? Do all methods actually eliminate the oil from the environment or do some only remove it from sight? When class is over, remember not to pour the contaminated water down the sink!
(Adapted from an activity by Stephanie Martin and Rosanne W. Fortner in Oil Spill, OEAGLS Investigation #17.)

ACTIVITY NINE: CULMINATION

Students view the video, "Inspection of an Oil Well". (It can be obtained from the U. S. Bureau of Reclamation, Natural Resources Section of BLM, Bozeman, Montana, 59717.

Read page 12 and choose 3 of the 6 "Things to Do" from page 13 of Dinosaurs and Power Plants to be completed in cooperative learning groups.

Using page 15 for addresses, students will request information on a fossil fuels topic of his/her interest.

EVALUATION:

Students will present a portfolio of materials and learning activities assembled representing their work during the course of this unit.

RESOURCES:

1. Bureau of Land Management. Oil and Gas. Math and Science Workshop. Haskell Jr. College. 1993.
2. Caduto, Michael J. and Joseph, Bruchac. Keepers of the Earth. Golden, Colorado. Fulcrum, 1989, p. 31.
3. Heimler, Clark H. and Neil, Charles D.. Principles of Science Book 2. 4th Edition. Publisher, Charles Merrill Co.. Columbus, Ohio. 1979.
4. U. S. Department of Energy. Dinosaur and Power Plants. Washington, D. C.. 1991.
5. 700 Science Experiments for Everyone. Compiled by UNESCO. Doubleday Dell Publishing Group, Inc., 666 Fifth Ave., NY, NY 10103.
6. Earth Notes. U. S. EPA. Communications, Education, and Public Affairs. 22k-1001, Fall, 1991. 401 M Street, S.W., Washington, DC 20460

PETROCHEMICAL PRODUCTS

Petroleum feedstocks provide us with
more than 3,000 different products.
Here are just some of them.

Ink
Heart valves
Crayons
Parachutes
Telephones
Enamel
Transparent tape
Antiseptics
Vacuum bottles
Purses
Deodorant
Pantyhose
Rubbing alcohol
Shag rugs
Epoxy paint
Oil filters
Pajamas
Upholstery
Hearing aids
Car sound insulation
Dresses
Cassettes
Motorcycle helmets
Pillows
Clotheslines
Shower doors
Soap dishes
Shoes
Tobacco pouches
Refrigerator linings
Electrical tape
Model cars
Folding doors
Floor wax
Sweaters
Sports car bodies
Tires
Dishwashing liquids
Unbreakable dishes
Toothbrushes
Combs
Toothpaste
Tents
Hair curlers
Lipstick
Ice cube trays
Electric blankets
Tennis rackets
Drinking cups
House paint
Rollerskate wheels
Guitar strings
Ammonia
Eyeglasses
Ice chests
Life jackets
TV cabinets
Car battery cases
Insect repellent
Ice buckets
Fertilizers
Hair coloring
Toilet seats
Denture adhesive
Loudspeakers
Movie film
Fishing boots
Candles
Water pipes
Car enamel
Shower curtains
Credit cards
Aspirin
Permanent-press clothes
Golf balls
Detergents
Sunglasses
Glue
Fishing rods
Linoleum
Plastic wood
Soft contact lenses
Dice
Trash bags
Hand lotion
Shampoo
Shaving cream
Safety glass
Awnings
Salad bowls
Plywood adhesive
Cameras
Anesthetics
Artificial turf
Artificial limbs
Bandages
Dentures
Mops
Beach umbrellas
Ballpoint pens
Boats
Nail polish
Golf bags
Tool boxes
Caulking
Tape recorders
Curtains
Vitamin capsules
Dashboards
Putty
Percolators
Skis
Tool racks
Slacks
Yarn
Insecticides
Fishing lures
Perfumes
Shoe polish
Petroleum jelly
Faucet washers
Food preservatives
Antihistamines
Cortisone
Dyes
LP records
Vaporizers
Solvents
Cigarette filters
Roofing
Cold cream
Synthetic rubber
Glycerin
Rubber cement
Nylon rope
Fan belts
Umbrellas
Paint rollers
Luggage
Antifreeze
Refrigerants
Typewriter ribbons
Footballs
Paint brushes
Balloons

WHY SHOULD WE STUDY OIL AND GAS

- If you were to be asked how important is the petroleum industry, you would probably answer by saying "very important"; however, few people understand the impact that the petroleum industry has on every man, woman, and child in the world.

- In addition to products such as gasoline, diesel fuel, fuel oils, lubricants, kerosene, jet fuel, asphalt, etc., hundreds of other products are made from crude oil.

- The petroleum industry is one of the largest customers of almost every other major industry in the U.S.

- The petroleum industry today provides 75 percent of our energy needs. Coal provides 19 percent and 6 percent comes from other sources, such as nuclear, wood, geothermal resources, wind, sun, etc.

- The Petroleum Industry is made up of a mixture of Corporations and Companies, some very large and some very small. A major operating company may consist of a corporation that provides services throughout the world through thousands of interdependent organizations; whereas, the smallest may consist of a husband and wife company that operate and produce a small producing oil or gas well.

- The U.S. has over 42,000 companies associated with the Petroleum Industry.

- The petroleum industry is owned by over 3 million stockholders.

- The petroleum industry employees over 1 1/2 million workers.

- The petroleum industry pays enormous amounts of money in taxes each year.

- Almost every citizen of the U.S. are customers of the petroleum industry.

TRIBES THAT RECEIVE ROYALTY FOR OIL AND GAS

WICHITA, CADDO, DELEWARE
BLACKFEET
FORT MOHAVE
CHEYENNE-ARAPAHOE
CROW
ASSINIBOINE-SIOUX
HOPI
JICARILLA APACHE
CHOCTAW
CREEK
SEMINOLE
CHEROKEE, CHOCTAW, CHICKASAW
CHICKASAW, CHOCTAW
NAVAJO
PAWNEE
PONCA
CHILOCCO INDIAN SCHOOL
CHIPPEWA-CREE
SAC AND FOX
SOUTHERN UTE
UTE MOUNTAIN UTE
UTE (NORTHERN UTE)
SHOSHONE AND ARAPAHOE
TOHONO O'ODHAM/PAPAGO
CITIZEN BAND POTAWATOMI
ALABAMA-COUSHATTA

A REVIEW

MAJOR PETROLEUM REGIONS OF THE WORLD

EVIEW THE FOLLOWING:

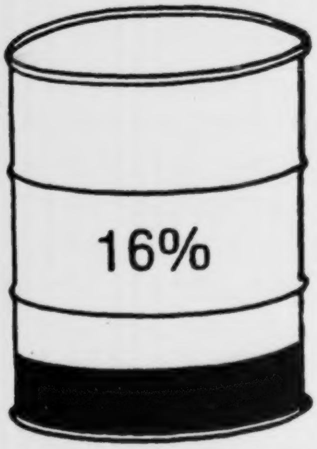
s result of the energy revolution in the first half of this century, the petroleum industry has dramaticall
hanged from being primarily a United States industry to one that spans the globe. The production, distri-
ution and consumption pattern that has developed dramatically illustrates the growing importance of the
ld's current and potential production to the United States as it faces the challenge of meeting its in-
ssing energy requirements and growing dependence on foreign sources. A summary of the majo
etroleum regions of the world and their relative importance is shown below.

MAJOR PETROLEUM REGIONS OF THE WORLD

REALM	PERCENT OF WORLD POPULATION	PERCENT OF WORLD PRODUCTION	MAJOR PRODUCING AREAS	PERCENT OF WORLD CONSUMPTION	PERCENT OF WORLD RESERVES
UNITED STATES	6%	16%	TEXAS ALASKA LOUISIANA	34%	4%
AMERICAN	9%	13%	MEXICO VENEZUELA CANADA	6%	13%
EURASIAN	64%	33%	U.S.S.R. CHINA UNITED KINGDOM	54%	16%
MIDDLE EASTERN	2%	25%	SAUDI ARABIA UAE IRAN	3%	55%
AFRICA, AUSTRALIA AND PACIFIC	19%	13%	NIGERIA INDONESIA LIBYA	3%	12%

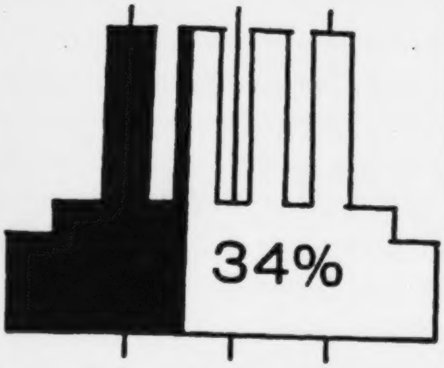
THE UNITED STATES

PRODUCTION



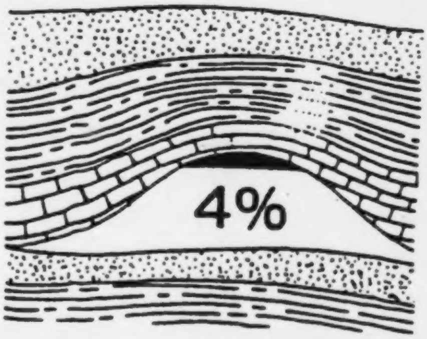
The United States produces over 3 billion barrels of petroleum a year, representing about 16% of the world's total. Although still a major producer of petroleum, its percentage of the world's production has declined steadily in recent years from the first half of the 20th century when the United States produced from 45 to 60% of the world's total.

CONSUMPTION



The United States currently consumes almost 34% of the entire world's production of petroleum. This figure is expected to increase dramatically in the projected future with consumption almost doubling in the next few decades. These increases in the demand for petroleum will further aggravate the limited supplies available.

RESERVES



Although the United States historically has been a major world producer of petroleum, its future is uncertain since only 4% of the known reserves of petroleum are located within the United States. This is further supported by the fact that fewer major discoveries are being made each year, and those that are, require drilling to greater depths in increasingly remote areas.

SCIENCE STANDARDS ADDRESSED IN GEOLOGY/FUEL RESOURCES UNIT –

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks –
Understands how science improves its predictions and explanations of the world through the continuous testing, revising and occasional discarding of theories; this leads to better understanding of the world, but not to absolute truth
Understands that science can inform (but not resolve) moral decisions and other matters that cannot be proved or disproved, by identifying the likely consequences of particular actions

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that the traditions of accurate record keeping, openness, replication and peer review keep the majority of scientists within the bounds of ethical behavior; violations of this behavior are eventually exposed and strongly condemned

Standard – Understands essential ideas about the composition and structure of the universe and the motions of the objects in it
Benchmarks –
Knows that current, increasingly more accurate technological tools include visual, radio and x-ray telescopes that provide information across the entire spectrum of electromagnetic waves and computers that manage large and complex data

Standard – Knows basic concepts about the earth
Benchmarks –
Knows that energy storage in ancient plants is still available to us in fossil fuels, which provide a convenient, transportable fuel for vehicles

Standard – Understands the cycling of matter and flow of energy through the living environment
Benchmarks –
Knows that millions of years ago, plants and marine organisms grew faster than decomposers could recycle them, resulting eventually in the stored energy of great coal beds and oil pools; and that the burning of these fossil fuels, rapidly releasing the stored energy back into the environment as heat along with carbon dioxide, has serious implications for our future
Knows that human technology can upset the balance of ecosystems, forcing them to draw on their reserves of living and dead biomass which can result in soil leaching, the enlargement of deserts and other reductions in the fertility of land

-- McCrel Compendium of Standards

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED –

Physical Science
Indian students should develop an understanding of chemical reactions and be able to relate this knowledge to traditional American Indian technologies such as processing of natural materials to make dyes, the detoxification of acorn meal through leaching, the firing of clay to make traditional Indian ceramics.
Indian students should develop an understanding of kinetic and potential energy, heat and energy transference, etc., and relate these concepts to traditional American Indian technologies such as the bow and arrow, the use of heating stones, the thermodynamics of a sweat lodge.

Earth and Space Science
Indian students should develop an understanding of the central interaction of sunlight (external energy) and the earth's heat (internal energy) which drive a variety of natural earth system cycles and relate this knowledge to traditional American Indian values/beliefs such as the Mother Earth concept, reverence for water and wind, the power of the Circle.

Science and Technology
Indian students should develop the ability to explain the interaction of science and technology – how new technologies advance scientific knowledge, and how new scientific knowledge advances new technologies – and the roles of creativity, scientific inquiry skills and knowledge base in order to discuss how these are manifested in the development of American Indian cultures, especially within their own tribes.
Indian students should develop an understanding of the importance of knowledge about science and technology as it applies to contemporary Indian communities in such areas as natural resource development, management and conservation.

History and Nature of Science
Indian students should develop an understanding of various opportunities for science careers.

--American Indian Standards by ORBIS Associates for Bureau of Indian Affairs

CARE OF LAND AND ANIMALS

All through history, animals have been important to Indian people for food and clothing purposes and sometimes for shelter. In the past, animal parts were also used for tools and utensils. Animals were, and are, a vital part of the cycle of life.

When the Indian people killed a buffalo, they used every part of it. They did not waste any part. The respect for the buffalo and for the land he grazed on was very important. Without that respect the buffalo would not have been able to thrive.

Until the middle of the 19th century, the lives of the Plains Indians were totally interwoven with the life of the migrating buffalo herds. The buffalo provided a wonderful assortment of gifts for people to use. Some of the gifts were food, clothing, shelter, musical instruments, games, tools and weapons, cooking pots, and carrying bags.

Before Indians got horses, the Plains tribes followed the buffalo by foot. They used dogs to carry their goods. The horse changed the way that Plains tribes hunted buffalo. They rode these sturdy horses on buffalo hunts and during battle. Indians loved their horses and took good care of them.

Today many Indian people are ranchers and use horses and dogs to help them in the raising of cattle or sheep. Some raise buffalo. The cattle, sheep and buffalo provide a livelihood for the ranchers who have learned how to best take care of their animals and to care of the land and plants necessary to raise them. They recognize the importance of all animals and plants in the natural system and view the earth as a mother that gives life to all things.

LITERATURE FOR CARE OF LAND AND ANIMALS UNIT –

Passing of the Buffalo in Keepers of the Animals or Native American Animal Stories by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1997. **Kiowa**

Buffalo Days by Diane Hoyt-Goldsmith, Holiday House, 1997. **Crow**

Thunder Bear and Ko: The Buffalo Nation and **Nambe Pueblo** by Susan Hazen-Hammond.

Gifts of the Buffalo Nation, Intertribal Bison Cooperative, **South Dakota**.

Hokshila and the Red Buffalo by Moses Nelson Big Crow **(Indian Author). Lakota**

Buffalo by Tiffany Midge **(Indian Author)**, Scholastic Books. Stories from **Seneca, Omaha, Ojibwa, Wichita, Apache, Kiowa**

The Secret of the White Buffalo, an **Oglala** Tale by C. J. Taylor **(Indian Author)**.

Dog People, Native Dog Stories by Joseph Bruchac (**Indian Author**).

The Horse and the Dog in **Hidatsa** Culture by Gilbert Wilson, J. &. L. Reprint Co. Vol 10.

How Wild Horses Were Captured by Montana Council for Indian Education, Billings.

Out of the Saddle: Native American Horsemanship by G. Pony Boy (**Indian Author**).

Horse, Follow Closely: Native American Horsemanship by G. Pony Boy, (**Indian Author**).

American Indians as Cowboys by Clifford E. Trafzer.

What's the Most Beautiful Thing You Know about Horses by Van Camp.

After Columbus: The Horse's Return to America by Herman Viola, 1994.

The Horsecatcher by Mari Sandoz. **Cheyenne**

Legends of Our Times: Native Cowboy Life, University of Washington Press.

Between Sacred Mountains: **Navajo** Stories and Lessons from the Land, Rock Point Community School (**Indian Author**), University of Arizona Press.

When the **Navajo** Had Too Many Sheep by George Boyce, Indian Historian Press, 1974.

Navajo Livestock Reduction: A National Disgrace, Navajo Community College Press.

American Indian Environments: Ecological Issues in Native American History, Syracuse University.

The Indian Way, Learning to Communicate with Mother Earth by Gary McLain, John Muir Pub., 1990. **Choctaw**

Who Speaks for Wolf: A Native American Learning Story, A Tribe of Two Press.

A Natural Education, Native American Ideas and Thoughts by Stan Padilla (**Indian Author**), Book Publishing Co., 1994.

Dwellings: Reflections on the Natural World by Linda Hogan (**Indian Author**), Norton.

Words of Power: Voices from Indian America ed. by Norbert S. Hill, Jr. (**Indian Author**), Fulcrum Pub., 1994.

ACTIVITIES FOR CARE OF LAND AND ANIMALS UNIT –

1. Have students learn about care of land and animals, read cultural materials and hear cultural perspectives relating to this topic.
2. Have the students research the importance of certain animals and plants to the local tribe(s). Have various students write reports on the most important plants and animals.
3. Have the students research what is being done to care for various animals and plants in the area/reservation. What offices are in charge of these things? Get and read copies of their brochures or reports indicating their activities.
4. Is there any overgrazing of the land? Are the deer overpopulated? Is erosion taking place? Are there other situations that may threaten the plants and/or animals? How is science applied? How is math applied?
5. What kind of livelihood does the raising of livestock provide today? Compare it to the livelihood provided by the buffalo. What do ranchers have to do to care for the land? For animals?
6. What does the class think about the cloning of animals? What animals have been cloned and where?
7. Have the students draw conclusions from their study of care of land and animals and create a handbook on the matter.

Following are example activities developed by teachers of Indian students who attended the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas and by Northern Arizona University's Science Learning Center. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities.

Hashke Vildeswood Tsosi

by Roger E. Tsosie

"Sheep herding could be big business if land and water were in ample supply," said Hashke as he rolled a shiny pebble in his hand while tending sheep.

Hashke, a Navajo, was raised in a beautiful land of mesas and canyons near Tselani Trading Post in the vicinity of Chinle, Arizona. He has lived in this part of the reservation for a long time, among the ever-enduring junipers and pinyon pine trees. "This place may look deserted; however, the Great Spirit of this clear-open-sky has kept everything in balance so that the animals, the plants, the ground and the sky are in perfect harmony," declared Hashke as he loaded another pebble into his sling shot.

Hashke is a long-time sheepherder. He has never been to school to learn the ways of the Anglo world. He enjoys his lifestyle. His unity with the environment is obvious. As he rolls another pebble around in his hand and then loads it into his slingshot he tells us that this, this land, this place, has been his classroom. It is a huge open classroom and mother nature is his teacher. Hashke has been off the reservation only three or four times to work on the railroad as a seasonal laborer.

When Hashke married a beautiful Navajo woman in 1953, he discovered that his new wife had many sheep without a sheepherder. He explained that since there was no one to care for his wife's sheep, he had to tend to the sheep. While sheep herding seemed to be a tiresome assignment, he came to love it just as dearly as he loved his wife. "It became a lifetime thing for me," he teased, "and of course if you were to stay married and be fed with all the delicious ways to fry potatoes and golden fried bread, I couldn't resist, but to stay with my wife! It was like striking a golden concha belt!" he chuckled. [A concha belt is a unique and intriguing article of adornment that appeared on the Navajo reservation around 1870. The circular or ovate plate gives the belt its name.]

Hashke claimed he was aware, to some extent, of what the Indian children were learning in their classrooms. "I never spent a single day in a classroom like today's Navajo children," he proclaimed. "Our children are very fortunate, and they should stay in school, to learn to count and discover the good things about our environment," continued Hashke while motioning his dogs to round up the animals once again. "I had to learn the hard way out here in the hills and canyons," he protested.

Navajo children are learning much about their natural environments in school. They study biomes all over the globe. A biome consists of all of the animals and plants that live in a region with a particular climate. They learn that the Navajo reservation has deserts, grasslands and coniferous forests. Coniferous trees are cone-bearing trees like pines and junipers which have needles for leaves. Because they loose a few needles at a time all year round they are often called evergreens. Deciduous trees like oaks and maples lose all of their leaves every fall. They also learn that the name for scientists who study plants is botanists and for scientists who study animals, zoologists.

Hashke recalled that according to the Navajo marriage tradition, when a young Navajo man got married, he had to take on the responsibilities of all of the members of his wife's family. He was expected to immediately build his hogan near his mother-in-law, but he was to avoid eye contact with his wife's mother. To do so (even accidentally) meant misfortune or impoverishment. However, if he was clever to maintain eye avoidance, he was able to gain respect and even wealth within that family.

This was the case with Hashke when he got married. Half of his wife's one-hundred-eighty-four sheep belonged to the rest of the family. "She claimed that they were her sheep!" he cried. He had to tend to those sheep from sunrise to sunset. And so, that's how he became a sheepherder, by marriage and by the expectation of his in-laws.

There's something about those sheep," Hashke wondered, "they lack knowledge to spread out in pastures, but if you have a number of goats, say a ratio of four goats to every twenty sheep, then they pasture out evenly." He explained that the goats are like leaders. "They lead the flock and they move fast. The goats are very energetic; they can climb steep hills. But you have to be careful where you herd them or how you herd them among the hills," Hashke cautioned. "If they climb straight up into the hills, they lay open channels for water erosion when it rains, but if you allow them to move sideways then the rain or snow water will settle into their tracks and eventually there will be fresh vegetation for them," he said. Hashke has obviously had many practical lessons in soil conservation.

Hashke's practical knowledge of conservation practices gained from sheepherding is often repeated in schools on the Navajo reservation. In science classes students study wise use of natural resources and good conservation practices.

Hashke said that it was clever for a sheepherder to know something about predators, like coyotes. He said that his sheep eat only vegetation (herbivores), but that coyotes are meat eaters (carnivores). He explained that since coyotes are meat eaters, they may be very sly, and can quickly snatch one of your fat sheep. "Coyote is the snicker you have to be careful of!" he yelled.

Hashke might be surprised if a Navajo student joined him for a walk and could identify an animal from a jaw bone found on the ground. In school students learn that carnivores have many sharp canine teeth to tear and shred meat and that herbivores have many large flat molar teeth along the sides of their mouths to crush and grind plants.

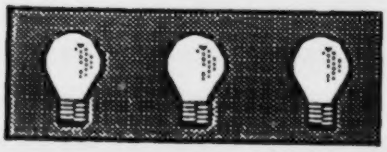
A story, "Never Cry Wolf," often read by young students in the classroom, was described to Hashke at this time. ("Never Cry Wolf" is about a young boy who is herding sheep and alerts the townspeople that a wolf is nearby. There is really no wolf but he wanted to fool the people. He does this a second time and is reprimanded. The third time, when the young boy crys, "Wolf", no one comes. This time there really is a wolf but because of his previous behavior no one believes him.) At the conclusion of the the story, he chuckled and said, "Yeah, but the goats are wiser, because they can yell for help when they're being attacked. But the sheep, they act so innocent and never cry wolf!"

Through his many years of herding sheep, Hashke has kept the maximum number of sheep permitted by his tribe, in spite of weather conditions including seasons of drought . He has a Navajo Tribal grazing permit which allows him one-hundred-fifty sheep and eight horses. The permit has a statement that requires him to keep his livestock in the best of health. He attends a community chapter meeting once a month to be informed by the Chinle Agency Grazing Committee Members about the types of vaccinations needed to immunize the sheep against different diseases. Often he takes his injured animals to a veterinarian in Chinle for treatment. Hashke also uses herbal medicine for his sheep when he recognizes symptoms of specific diseases and knows the appropriate treatment.

Hashke observes the night sky, the air movements, the clouds in the sky, the insects and the lengths of different types of grasses, to predict the condition of the coming winter. If a hard, cold, snowy winter is coming, the insects are plentiful and are very busy gathering food from early dawn to late in the evening. "For instance," he said, "there would be countless red ants going every which way gathering food as though this is going to be the last winter!" When he finds an unusual amount of edible grass, above knee high, for sheep, "that indicates the height of the coming snow," declared Hashke.

Hashke might be surprised to know that many scientists are interested in his observations because they also think that looking at patterns in nature helps predict the best planting and harvesting times. Phenology involves the recording of dates and times and weather for many natural phenomena (blooming times of different plants, the return of migrating bird species, the hibernation of animals,etc.) and using this information to predict other events.

"Herding sheep is a great teaching tool," explained Hashke. "It teaches you to be responsible, patient, loving and kind. It teaches you to be a good decision maker. You could go on and on to name all kinds of good qualities sheep herding has allowed me to develop," he commented. He wishes that Navajo could keep grazing sheep, but he knows that the land is getting smaller because of ever populating generations, and that the people are changing due to the proper education for the young people. However, "sheep herding could be big business . . .," he said, "because sheep provide income when you trade them to the trading post." "You can shear the wool to trade it to the store or you can even weave the wool into beautiful hand-woven rugs, like my wife does all the time," he concluded. For Hashke, sheep herding is big business!"



CONTENT QUIZ

Is is true or false?

1. Hashke's environment is like a huge open classroom with nature acting as the teacher. __________

2. Hashke has been in school three or four years. __________

3. Hashke believes the Indian children should stay out of school to learn about the environment. __________

4. The goats act like leaders. __________

5. There's less erosion if the sheep are herded sideways against a steep hill. __________

6. The goats never cry "wolf." __________

7. Hashke has a tribal grazing permit for 150 sheep and 8 horses. __________

8. If he recognizes the symptoms of the disease and knows the appropriate treatment, Hashke uses herbal medicine to treat his animals. __________

9. When there are countless red ants busy gathering food, Hashke predicts a hard winter. __________

10. The sheep are both plant and meat eaters. __________

VOCABULARY ACTIVITIES

Synonyms

Synonyms are words with similar meanings. Match the words in the left column by drawing lines to their synonyms in the right column.

thrifty
responsibilities
prairie
environment
vaccinations
erosion
destitute
tradition
tiresome
ample

plenty
poor
destruction
boring
frugal
duties
custom
shots
grassland
surroundings

Definitions:

During lambing season, Hashke likes to match the ewes with the baby lambs. Which definition from below best matches the word in the rectangle? Write the letter on the line under each word.

vegetation ____	veterinarian ____	herbal medicine ____
symptom ____	predict ____	economical ____
knowledge ____	restrain ____	pasture ____

A. Understanding or wisdom

B. An outward sign, such as fever

C. To foretell or to guess before it really happens

D. An open field or meadow

E. Traditional plant medicine

F. Not wasteful

G. Plants

H. An animal doctor

I. To keep from doing something

WORLDS WITHIN YOUR WORLD
An Overview of Local Habitats
Student's Guide

Focus of Inquiry: Are you familiar with all of the different aeas or habitats of your tribal lands? Can you locate the different habitats on a local map and ecologically describe these areas?

In this activity, you will first map out and color code the various habitats found on your reservation. You will then discuss these areas or habitats with an elder at home or from the community who has known the area for a long time and quite well. You will record this information and then pool it as a class. Finally, in class, you will be part of a group and together you will develop an overall profile or detailed description of one of the areas you have researched. You will combine ecological information and the information from home to develop the profiles. Again, these final profiles will be shared with the entire class.

Why Is This Important?

- -- You will be more familiar with your own reservation environment. This can help you work with your environment to the best advantage and prevent misuse of it.
- -- You will gain skills of map creation and interpretation.
- -- You will learn and remember knowledge from your relatives.
- -- You may consider becoming an ecologist or working in Natural Resources, this activity gives you experience for those fields.

Procedure:

Materials:

Phase I	Phase II	Phase III
copies of reservation map set of colored pencils	color-coded maps questionnaire forms tape recorder (optional)	completed questionnaire forms ecological profile forms display or presentation materials

Phase I:

1 The teacher will have his or her map on the overhead projecter and will be working there, while you have your map and colored pencils and are working at your place. The teacher will ask you to suggest a color to represent a certain habitat. One of you will respond. The teacher will start a key by drawing a swatch of that color at the top of the map and adding the name of the habitat next to it. You will do the same.

2 The teacher will question you about the habitat: Where is it? What is it like? What are its important ecological characteristics? What is the habitat's name?

3 After a short discussion, the habitat will be shaded in on the map, and the name placed next to its color code at the top of the map.

4 Repeat this procedure for all the possible habitats.

5 Add in other natural landmarks: rivers, springs, swamplands, mountain peaks, etc. Use special symbols to represent these landmarks. Write in their names in the tribal language.

6 Discuss the overall picture; ask questions. Be sure that these areas are separate habitats within a general environment.

A What is the name of your general environment?

Phase II:

1 To help you with this assignment, the teacher will pass out the questionnaire form which you will take home. You will discuss it, and the teacher will give you examples on how to do it.

2 Take home your maps and questionnaires. As you have been instructed, interview a knowledgeable relative(s) or older friend and write down what they tell you. You may wish to tape record the conversation and then finish your forms.

3 Bring the assignment back to class. The information may now be pooled and shared in class.

Phase III:

1 You will form groups. Each group will be responsible for a certain habitat.

2 As a group, you will complete the ecological profile form for your habitat. Add in what you have learned from home. You may also ask other class members what they learned from home about your habitat if you need more information. Finally, everyone in class will fill out profiles of all habitats based on presentations in class sharing all information.

3 Each group may either make a presentation to the class about its habitat or create a display about its habitat which gives more than enough information to the other students for them to fill out a habitat form. Whether you give a presentation or create a display for your habitat, you should NOT simply give only the information for the charts for other students to copy. Be creative; let the other students figure out the information from the wealth of information you provide in either your presentation or display.

4 A review will be held in class.

5 All work is to be turned in -- the color-coded maps, the interview forms, and the ecological profile forms.

NOTE: You may make field trips to the various habitats either before or after this activity.

Self Check: Do you know the following words? habitat, ecological, profile, color-coded, swatch, key, topography, geology, hydrology.

Your teacher may evaluate you on your maps, interviews, group work, class sharing, and may give you a quiz or test on the subject of this activity.

Going Further: You may wish to:

- (Re)visit the areas you have studied.
- Create a microhabitat in class.
- Write letters to appropriate authorities voicing concern about anything you have learned about your lands.
- Create color-coded maps of your state, the country or the world.
- Investigate the borderline areas between habitats.
- Create a map with all the names in your tribal language.

Additional Resources:

- Ecology texts
- Local atlases
- Tribal history texts or other publications
- Professionals in natural resources
- Local, state or national park employees
- Local hunters
- Local people other than the one(s) you spoke with for your interview.

Related Careers: You may wish to consider the following careers because the techniques you've used in this investigation are used by the following professionals:

-- Ecologist
-- Rancher
-- Natural resource specialist
-- Geographer

HABITAT PROFILE CHART

NAME OF HABITAT: ______________________________ ALTITUDE: ____________

WEATHER CONDITIONS (throughout the year, include winds and precipitation):

____

____

SOIL: ____

TOPOGRAPHY AND GEOLOGY OF THE AREA: ____________________________

____

____

HYDROLOGY: (What or where is the source of water? What are the patterns of water movement? Are there bodies of water?):

____

____

____

DOMINANT PLANT(S): ____

VARIETY OF PLANT LIFE:	Very Much	Much	Little	Very Little
Number of different types of plants:	20-30	10-20	5-10	1-5

ANIMAL LIFE: ____

____

____

HAS THIS AREA BEEN DISTURBED BY PEOPLE? _________ IF SO, DESCRIBE HOW:

____

____

CAN THIS HABITAT BE IMPROVED? ___________ IF SO, HOW? ___________

____

SUMMARY: WHAT ARE THE MAJOR FACTORS WHICH MAKE THIS HABITAT WHAT IT IS?

____

____

____

LEARNING FROM YOUR ELDERS ABOUT THE LOCAL ENVIRONMENT

Directions: Take your map and this assignment home to discuss the different habitats with an older relative or friend. Find someone who is familiar with many areas of the local environment. Explain what you are doing and discuss each of the habitats on your map with your relative or friend. Give them good directions for where the habitat is located. Then for each habitat, ask the following questions: What is the area like now? What kinds of plants or animals might you find there? Is there water? What is the soil like? What is the weather like? What was the area like many years ago? How has it changed? Have people affected the area? What is the area good for?

(You may find out alot of information about one habitat but little on another; simply do the best you can.)

Use a separate sheet for each habitat and set it up like the sample below.

* * *

Name of Habitat:______________________________

Person with whom you spoke (grandmother, grandfather, father, mother, aunt, uncle, cousin, friend, other:______________________________

How far back can the person remember the habitat? ______________

What was said:

WORLDS WITHIN YOUR WORLD
An Overview of Local Habitats
Teacher's Guide

Overview: It is surprising to find out how many students are unfamiliar with their reservation lands and their environmental characteristics. This activity not only familiarizes the students with the overall ecology of their environments but also allows the students to learn from their elders about the historical and natural characteristics of the different areas of the reservation.

The activity is composed of three phases. First, a local reservation map is used upon which the students delineate various habitats and color/key code them. Then, in the second phase of the activity, students take their maps home, show them to their families, and gain information from members who are familiar with the history and ecology of the various habitats of the reservation. The information from home is recorded and brought back to class to share.

Objectives: The students will:

- -- Familiarize themselves with the habitats of their reservation lands (many of the students are not familiar with all areas of their lands).
- -- Delineate and code all the various habitats on a map of the reservation.
- -- Research information about the various habitats of the reservation with family members or friends.
- -- Focus on one habitat in a group and share their information with the class through displays the group creates or presentations the group gives.
- -- Compose an environmental profile on each of the habitats from the map which combines information from the teacher, the text, their families and other classmates.

Techniques and Information: Either from your introduction or from their readings, the students will need some background about what is meant by habitat, what determines and affects habitats, and other factors or ideas related to the concept of habitats. As you know, ecological terms and concepts are often confusing, and so it seems best that you approach the introduction in a way that is most effective for your students. In some cases, habitat may be described in terms of the abiotic factors. In other cases, the description of habitat involves an indication of environmental factors from the point of view of various species or biotic factors. In this case, since the students are first dealing with habitats geographically (the maps), you may want to approach the concepts of habitat from a more abiotic point of view. Then tie in the biotic with most of your concentration on the flora rather than fauna, since the names of the habitats are almost always based on the dominant species of plants.

Resources: You may wish to consult with a cultural liaison to determine what is reasonable for the student to learn at home to complement this lesson. If necessary, invite the cultural liaison to class to share additional relevant cultural information.

A very good reference to use for your introduction is found in Modern Biology, which offers an entire chapter entitled "The Habitat." The chapter deals with terms and concepts or factors, such as the definition of habitat, limiting factors of the habitat, soil, temperature, water, light, the atmosphere, tolerance, niche, etc. As you analyze the habitat profile sheet that the students will be working with, you can see that these are appropriate topics to use for your specific introduction or for your larger unit in ecology, of which this activity may be a part.

For local ecological information, you may find a wealth of materials in a comprehensive Environmental Impact Report or other governmental publications pertaining to the reservation. Often an EIR will provide not only long lists of ecological information but also maps delineating habitats, showing land use, topography, soil types, etc. These reports may be available through the tribe, the BIA, or other environmentally related offices. In these offices, you may find resource people as well who may give you leads about information appropriate for this activity.

A wide variety of maps offering ecological information to the students is also available from the nearest USGS agency. Maps of the reservation should be available through tribal offices. Once you obtain a simple map of the reservation lands, make copies for the students and make an acetate copy for your use on the overhead projector (many thermofax or copy machines can do this). You will also need a set of colored markers which work on the acetate map to color-code the habitats. Before you use the maps with the students, develop a set of symbols for specific characteristics, such as swamplands, springs, irrigation land, etc. You may refer to standard maps for these symbols.

There is some flexibility to this activity when it comes to the students visiting the habitats. It is obviously up to you to design the most appropriate and convenient arrangements for traveling far and wide. As a class, you may wish to visit the habitats specifically for this activity. Or, since this can cover many miles, visiting the habitats from an ecological point of view can be combined with visiting the habitats during the Bicultural Plant Collection activity. It would help the students to know ahead of time, which area is the special habitat for which their group is responsible. Another alternative would be to have the students visit the habitats on their out-of-school time as homework. At any rate, it is strongly encouraged that the students visit the habitats in conjunction with this activity.

The students may wish to photograph the habitat for their displays or presentations. Another alternative would be that you photograph the habitats if it is impossible for the class to visit all the areas needed for this activity. The students may also want to do drawings depicting the habitat.

NOTE: Except for visiting the habitats, which can take place earlier in the year, this lesson plan is a good winter activity in that most of it takes place indoors. Also, since the students are to ask many questions of their elders, traditionally winter is the time to tell stories and relate information.

For the third phase, the result should be that each student has a Habitat Profile Chart completed for each habitat in the local environment. They do this by serving in a group which concentrates on one habitat and then all groups share information. In this way, all students wind up with all the information they need for each habitat. The students may like to serve in a group which works on a habitat that is of personal interest to them -- perhaps this is where they live, have land, or where they obtained particularly good information from their home research. The group size should be around 3 or 4; if there are not many habitats in the local environment you may wish to have several groups work on the same habitat. It will be necessary to make enough copies of the Habitat Profile Chart so that each student has the number he/or she needs to report on each habitat being studied.

In this third phase, the groups have a choice of how they are going to share their special habitat information with the rest of the class. Either choice they make--whether they give a presentation or create a display--the information they share should not simply be only the information that goes on the Habitat Profile Charts. They should provide an ecologically thorough and creative picture of the habitat which ties in the information from home. It will be from this larger source of information that the other students can find the information they need for their charts.

For a display, the students may wish to include drawings, photographs, model habitats, collages, etc. For a presentation, the students may again wish to use slides, drawings and other creations. The scheduling recommended would be to devote one day for students to tour the displays and find the information they need, and one day to hear the presentations for the information they need on those habitats.

Evaluation: The Objectives may be used as guidelines when you design your own evaluation to this activity. (Don't forget to evaluate non-academic skills such as technique, a "willingness" to try or teamwork.)

Extension:

-- Visit or revisit the habitats, perhaps with elders.
-- Recreate representative microhabitats in the classroom.
-- Write letters to appropriate authorities voicing concern over specific issues in the environment revealed in this activity.
-- Create similar maps for the state, the United States, and the world.
-- Add in as many tribal names as possible to various places on the maps.

SCIENCE STANDARDS ADDRESSED IN CARE OF LAND AND ANIMALS UNIT –

Standard – Knows about the diversity and unity that characterize life

Benchmarks –

Knows that the diversity of organisms within a species increases the likelihood that at least some members of the species will survive under changed conditions

Knows that the similarity of organisms inferred from similarity in their molecular structure closely matches the classification based on anatomical similarities

Knows that the degree of kinship between organisms or species can be estimated from the similarity of their DNA sequences

Standard – Understands the genetic basis for the transfer of biological characteristics from one generation to the next

Benchmarks –

Knows that genes, the sub-units of cell components called chromosomes, convey encoded information directing the synthesis of a cell product, and can often be identified with a trait observed in the organism

Knows that the genetic instructions, which are almost identical in each cell's descendants, are encoded in DNA, and can produce different types of cells by using different parts of the instructions, the part of the genetic instructions used depending on a cell's immediate environment

Knows that genes are segments of DNA molecules, and that inserting, deleting, or substituting portions of the DNA can alter genes; changes in DNA (mutations) can also occur when a cell is exposed to certain kinds of radiation or chemical substances

Knows that if an altered gene is in a sex cell, it may be passed on to offspring; if change occurs in another cell, it is passed on only to the products of that cell

Knows that features resulting from an altered gene may help, harm, or have little effect on the offspring's success in its environment

Knows that fragments of DNA can be analyzed to identify the individual from which the sample of DNA came, diagnose human genetic abnormalities, and to study populations

Standard – Understands how species depend on one another and on the environment for survival

Benchmarks –

Knows that the interdependence of organisms helps to stabilize food webs when minor changes in the environment occur, and results in reasonable stability over hundreds of thousands of years

Knows that like many complex systems, ecosystems have cyclic fluctuations around a state of rough equilibrium

Knows that ecosystems always change when climate changes or when very new species appear as a result of migration or evolution (or are introduced deliberately or inadvertently by humans)

Knows that if a disaster such as floor or fire occurs, the damaged ecosystem is likely to recover in stages that yield a system similar to the original one

Knows that as any species proliferates, it is held in check by one or more environmental factors;: depletion of food or nesting sites, increased predation, or parasites

Standard – Understands the cycling of matter and flow of energy through the living environment

Benchmarks –

Knows that the amount of life any environment can support is limited by the available energy, water, oxygen, and materials, and by the ability of ecosystems to recycle the residue of dead organic materials

Knows that human technology can upset the balance of ecosystems, forcing them to draw on their reserves of living and dead biomass which can result in soil leaching, the enlargement of deserts and other reductions in the fertility of land

Knows that biological systems – cells, multicellular organisms and ecosystems – obey the same conservation laws as they do in physical systems; the conservation of energy law is a powerful tool for the analysis of metabolic processes in cells and organisms, as well as for the analysis of energy flow in ecosystems

-- McCREL Compendium of Standards

AMERICAN INDIAN STANDARDS ADDRESSED IN UNIT -

Life Science

Indian students should develop an understanding of the fundamental tension between living organisms' capacity for infinite growth and the finite nature of environments and resources and to relate knowledge of this tension to traditional American Indian values about ecology.

Indian students should develop an understanding of photosynthesis as the basis for all food sources within the chain of plant and animal life in order to relate this knowledge to traditional American Indian beliefs about he interdependence of living things.

Science and Technology

Indian students should develop the ability to explain the interaction of science and technology – how new technologies advance scientific knowledge, and how new scientific knowledge advances new technologies – and the roles of creativity, scientific inquiry skills and knowledge base in order to discuss how these are manifested in the development of American Indian cultures, especially within their own tribes.

Science in Personal and Social Perspectives

Indian students should develop an understanding of historic and contemporary contributions of American Indians to current knowledge about conservation and healthy ecological practices and how these relate to applications of modern science and technology in local, regional, national and global circumstances/problems.

History and Nature of Science

Indian students should develop an understanding that traditional American Indian life involved skills and practices common to the process of scientific inquiry.

Indian students should develop an understanding of science as it is practices by American Indian scientists and science/technology related professionals in their communities.

Indian students should develop an understanding of various opportunities for science careers.

WATER

Water is central to all life processes. It has been an important element in Indian cultures and is a sacred substance. There is a spiritual connection to the clouds and to the rains. Water is one of the four elements, with fire, air and earth, sometimes referred to as the Four Ancestors by Indian people. These elements are gifts and must be treated with respect. We cannot keep polluting our water sources. About 20 countries are currently water-scarce or water-short. The number is to double by 2020 (United Nations). The need to care for Mother Earth and her gifts has to be taught to all ages.

Water and fish are important tribal natural resources. Water is sought by others for a variety of reasons, and tribal water resources have been taken or changed in ways that oppose tribal views and tribal sovereignty.

LITERATURE FOR WATER UNIT –

Gardens in the Dunes by Leslie Marmon Silko (**Indian Author**), Penguin.

The Invasion of Indian Country in the Twentieth Century: American Capitalism and Tribal Resources by Donald L. Fixico (**Indian Author**), University Press of Colorado.

Ecocide of Native America: Environmental Destruction of Indian Lands and Peoples by Donald A. Grinde, Jr. and Bruce E. Johansen.

The Fight Against Garrison Dam in Of Utmost Good Faith ed. by Vine Deloria, Jr., Straight Arrow Books, 1971.

Indian Land in Our Brother's Keeper: The Indian in White America ed. by Edgar S. Cahn, A New Community Press Book, 1969.

Four Ancestors: Stories, Songs and Poems from Native North America by Joseph Bruchac (**Indian Author**), Bridgewater, 1996. Includes selections about water.

The Man Who Loves Salmon by Sherman Alexie (**Indian Author**).

Rain: Native Expressions from the American Southwest by Ann Marshall.

Green Grass, Running Water by Thomas King (**Indian Author**), Houghton Mifflin, 1993.

Wind from an Enemy Sky by D'Arcy McNickle (**Indian Author**), Harper & Row, 1978.

Solar Storms by Linda Hogan (**Indian Author**), 1995.

ACTIVITIES FOR UNIT -

1. Have the students learn about water and water conservation, read cultural materials and hear cultural perspectives relating to this topic, and determine the local and tribal water situations.

2. Have the students research to learn what the water source(s) are for the area/ reservation. What is the source for the drinking water at the school? Are the water resources maintained and kept clean?

3. How precious is water? What does it cost? How is it purified for the community? How much does it cost to purify the water? How much does an average family spend for water in a month? How much would it cost if a family had to buy bottled water? Other math applications?

4. Have the class visit the local water system and water sources.

5. Are water or fish tribal natural resources that are sought after by others? Have there been any problems for the tribe(s) regarding water rights? Has there been any taking or using of water resources by others? What have been the effects of this taking or using?

6. Have the students read and discuss Indian literature about water and Indian people.

7. Have the students draw conclusions from their study of water and write an article for the school newspaper.

Following are materials and example activities for two units developed by teachers of Indian students who attended the MASTERS project at the University of Kansas and by the Outdoor World Science and Mathematics project at Northern Arizona University. Adapt these activities for your students. Review the science standards for this unit. They will suggest further science and math activities.

Fred Charette

By Richard Preite

Water towers exist in almost every city. Some are larger than others but they all serve the same purpose . . . storage of city drinking water. Did you ever wonder how the water gets from the underground spring or reservoir or river to the top of the water tower and then to your faucet? What keeps these water towers working and what makes them a safe storage facility for drinking water? These interesting and important questions will be answered by Construction Representative, Fred Charette, of the Northern Cheyenne Indian Reservation in Montana.

Construction Representatives are responsible for a lot of different jobs on the reservation. Fred must maintain the tank in which the drinking water is stored. He must test the drinking water to be sure it is safe to drink. He must be careful to maintain a water level safe enough to handle emergencies such as fires. He also monitors the reservation's waste water and designs wells, septic systems, sewer and water lines.

He is also familiar with the operation of the entire water distribution system. There are two submersible pumps about one hundred feet underground. Each pump is six inches in diameter with a four inch pipe running from it. This pump propels the water at a rate of fifty-five gallons per minute into a six inch water main. On the water main there is a "T" going to the water tower which is a one hundred thousand gallon tank. The pump brings the water to the surface and into the service lines for the homes. Whatever isn't used will go up to the tank for storage.

Fred has an automatic water control device called an Autocon that works off pressure from the main line. He has calculated the difference from that point where he takes the pressure off in the pumphouse to the top of the tank. There are 2.31 pounds/square inch of pressure required to raise water one foot. He has calculated it so that the pump turns off just prior to the tank overflowing. He has a twenty pound differential, meaning the pump turns off at seventy pounds and when the pressure drops to fifty pounds, the pump will start again and increase the pressure in the system until it reaches seventy pounds.

What happens if everyone flushes their toilets at once? Well, Fred explains that there are two pumps and each is capable of putting out fifty-five gallons of water per minute. Mathematically . . . fifty-five gallons per minute multiplied by sixty minutes in an hour is a total of three thousand three hundred (3,300) gallons of water per hour. Now, let's say there are four gallons of water used every time you flush. Three thousand three hundred gallons per hour divided by four gallons per flush equals eight hundred twenty-five flushes per hour. You would have to flush toilets eight hundred twenty-five times in one hour to match what the pump is putting out.

The pump doesn't know whether it is night or day. You can water your lawn all day long and the pump will put out this three thousand three hundred gallons of water per hour. But, at night, when all is shut off, it's going to catch up and fill the one hundred thousand gallon tank. Because the system has the night to recuperate, it has been the only back-up Fred needs.

Let's say there was a major fire or something that actually would tax the system. The lead pump would start out. Let's say it couldn't keep up, then the second pump would kick in. Now, instead of three thousand three hundred gallons of water per hour, there are six thousand six hundred gallons and that is an awful lot of water.

There was one occasion in which there was not enough water being pumped in. Fred discovered a leak in one of the pipes. The pump would pump the water upward but some would drop back down from the leak. The water was just circulating. Needless to say, the pipe had to be repaired.

Does the water in the water tower storage tank freeze? "No, it sure doesn't. There is enough activity in the tank where it may freeze on the walls but not solid. There is just too much fluctuation."

Maintenance of the tank is another duty of Fred's. He must drain the tank completely to be cleaned, painted and resealed inside and out. Mastic, a plastic epoxy type of substance is used for painting and resealing water tanks.

The whole process is done entirely inside the large tank. A hoist is used to bring fans or other air-moving equipment to the tank. This is necessary due to the toxic odor of the Mastic.

First, the inside must be sandblasted. Once completed, Fred must climb into the tank and measure the pits where the metal has corroded. He does this to determine whether or not the skin of the tank will need to be patched. After the Mastic is applied, Fred must measure once again to determine the thickness.

Fred comments that I have just asked some questions which could demonstrate another basic science concept. About the water in the tank freezing, that is an example of a physical change. Water just changes state. It goes from a liquid to a solid. But the corrosion of the water tank, that's a different matter. The metal has been oxidized or chemically changed by the reaction of oxygen and the metal tank in the presence of water. The metal tank is now a completely different chemical material where it has rusted and that's why the pits are there and why the tank has to be patched. The oxygen (O) in the air has combined with the iron (Fe) in the presence of moisture to form rust or iron oxide (Fe_2O_3). "Now you know the difference between physical and chemical changes", Fred said.

How much does the tank weigh? Well, water weighs eight pounds per gallon so if it is a one hundred thousand gallon tank, it would weight eight hundred thousand pounds. Now that's a lot of water.

Fred is also responsible for maintaining high quality drinking water on the reservation. This requires a great deal of monitoring or water quality testing. At least once per week (Fred does it three times), the water must be tested for fluoride content. Fluoride is an important dietary supplement for the young and old alike. If the fluoride content is low, more is added. A sample is drawn and sent to a state certified laboratory for mandatory testing of several other chemicals. In addition, Fred takes a sample back to his laboratory and incubates it for 24 hours to see if there are biological contaminants. This is all Fred will test for in his laboratory.

If there is a break in the water line or the water line is opened for repair, the system is chlorinated to prevent biological contaminants. Chlorine is added to the water system to kill coliform bacteria or whatever else may be harmful to humans. This will kill most things in the water except Giardia. Giardia is a protozoan that comes from animal feces. It is commonly found in surface water and can also be found in ground water. Giardia can cause intestinal problems if untreated. If a contaminated system is discovered, a process called super-chlorination is utilized. Although there are some disadvantages of chlorinating a system, such as disagreeable odors or tastes, chlorine helps prevent waterborne diseases.

In addition to monitoring drinking water, Fred also monitors the reservation's waste water. Fred draws water samples from sewage lagoons which are sent to the Environmental Protection Agency laboratory to make sure that streams in the area are not being polluted.

Rarely are any chemicals put into lagoons. Occasionally in the Spring a perfume is added to mask the unpleasant odors. Also, enzymes may be added to activate bacteria. Enzymes (a group of chemical substances called proteins, which means they're made up of carbon and hydrogen compounds, do not enter into the chemical reaction but increase the rate of the chemical reaction) help bacteria grow and break up the solids in the sewer systems. There are not many problems with lagoons other than the odor. The Spring is particularly bad when the water "turns over". As the ice melts from the lagoons in early Spring the surface water, heated by the sun, warms up. When the water temperature reaches 4 degrees celsius it sinks and causes the water beneath it to mix. (Density is temperature dependent and water is most dense at 4 degrees celsius.) Soon, the water throughout the lagoon is at 4 degrees and even the slightest wind can cause complete circulation of the water from surface to bottom. When the nutrients on the bottom rise to the surface they bring along the bad smells cause by anerobic decay (decay without oxygen). This is why the odors from the lagoons are worst at spring turnover.

Fred also has construction duties. He designs wells, septic systems, lagoons, sewer lines and water lines, and inspects work being done. If there is no engineer involved in the construction, Fred writes the specifications and puts the work out for bid, reviews the bids, and reviews submittals of various components that will be used in whatever kind of construction is being done. He also inspects the work as it is being completed to ensure that it is being constructed properly and to government specifications. Fred must sign a drawing of the construction so the contractor can get paid. Finally, an overall inspection is completed to make sure everything is right and nothing has changed since the preliminary construction inspection.

In Fred's job understanding machinery and understanding energy are important. Fred knows that both kinetic energy and work involve motion. Anytime work is done, scientifically speaking, motion must be involved. The scientific formula for work is work=force x distance. This is represented by the equation: $W=F \times D$. Force equals mass times acceleration or force is simply any push or pull that causes something to move or change its speed or direction of motion. Kinetic energy is energy possessed by moving things as a result of their motion. (Energy is the property of something which makes it able to do work.) Potential energy is energy stored in an object as a result of a change in its position. Fred observes kinetic energy and potential energy every day. While the water is moving through the pipes it has kinetic energy but while it sits in the storage tank it has potential energy. Energy can not be created or destroyed but it can change forms. When the stored water moves down the pipes toward your kitchen faucet then the potential energy is converted to kinetic energy.

As you have no doubt gathered, Fred's daily routine is frequently interrupted, thus, most of his days are varied. One of his official duties is acting as a consultant to the tribe. If they call him and need help with something, then he's obligated to stop whatever he is doing and assist them.

Fred also helps the Indian Health Services staff recruit young doctors to the Indian Health Service field. He works with the recruits two or three days out of a six week period. They tour the reservation and Fred tells them what it was like just a short twenty-five years ago when they first started putting sanitary sewers on the reservation. Prior to that, it was privies and water from wherever they could get it. A few lucky families had pumps and driven wells. It was very unsanitary all the way around.

There has been a tremendous change in the lifestyle and health of the Northern Cheyenne Indians living on the reservation. Fred relates that this has been his goal - to improve the health of the people on the reservation. "Whatever it takes to get there, that's what I want to do. That's one of the more enjoyable parts of my work."

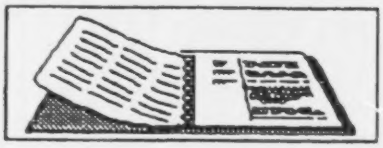
He finds his career challenging and rewarding. It gives him a good feeling when health and living standards are upgraded.

"I think I have the best of both worlds in engineering. I work inside designing systems and then I go out and actually watch them being built and finally, I get to see them in operation. I work with the whole thing - from surveying in the very beginning to the construction of a water or sewer line or a lagoon, the testing, and all the way through to operation. Then I get the satisfaction of seeing how many people it can help. I think I have the best position. A lot of engineers design things, send it out of the office and that's the last they see of it. I see the entire thing."

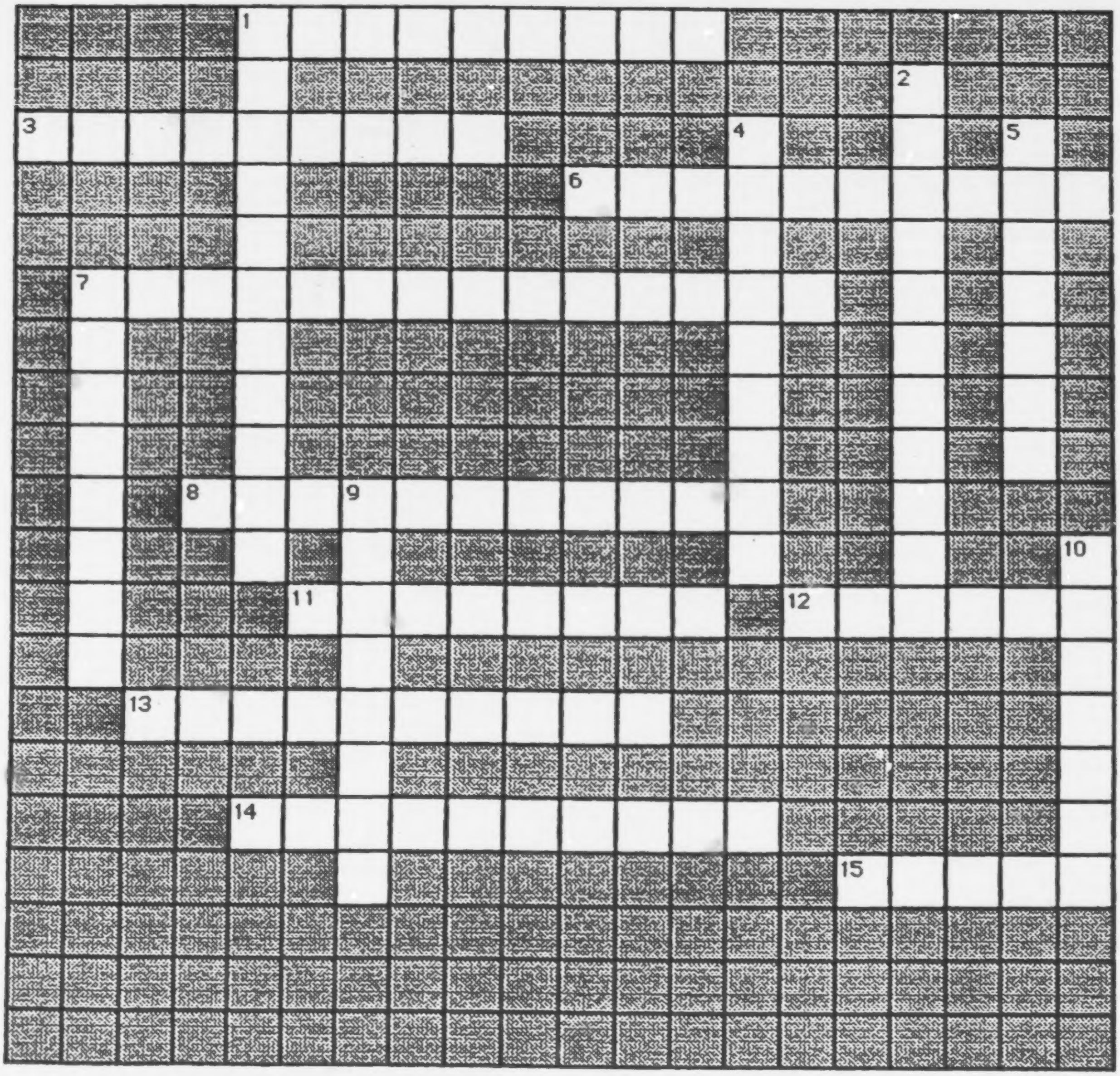
Although Fred is an extremely busy man, he has time for his family, his church, and always a friend. He is not only interesting, but very cordial. He truly believes in what he is doing . . . improving the health of his people. His science background has helped him do this quite effectively.

ACTIVITIES

1. Have the students do research and prepare written reports on the benefits of having fluoride in the drinking water.
2. Have the students do research and prepare written reports on Giardia and how it affects people.
3. Have the students do research and prepare visual presentations on the types of minerals found in the local water supply and what, if anything, is done to remove minerals.
4. Have the students do research and prepare visual presentations explaining the types of chemicals used to purify the local drinking water supply and how the process works.



VOCABULARY ACTIVITIES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Across

1. An act of surrender
3. maintains favorable conditions for growth
6. to get well or recover
7. a spokesperson
8. to shift irregularly
11. A chemical compound containing Fluorine
12. A shallow body of water
13. to treat with chlorine
14. One who gives advice
15. Waste matter excreted from the bowels

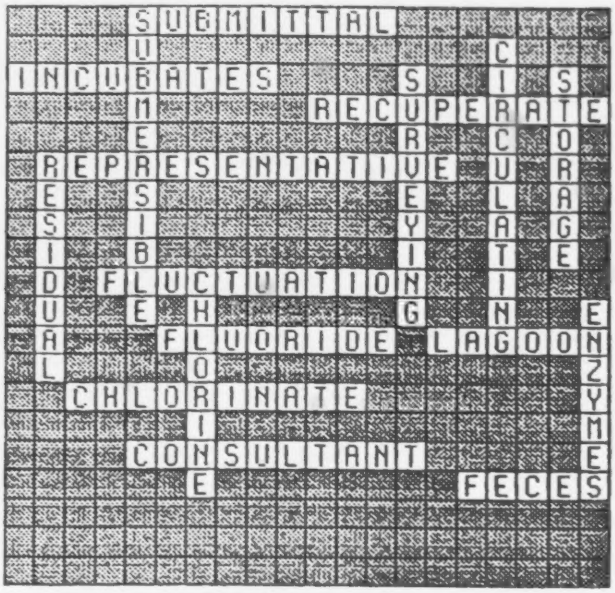
Down

1. Capable of being covered with water
2. moving about
4. Checking out the contour of the land
5. Place for storing
7. left over, remaining
9. A gaseous chemical element used in water purification
10. A protein substance that acts like a catalyst in chemical reactions

Word List:

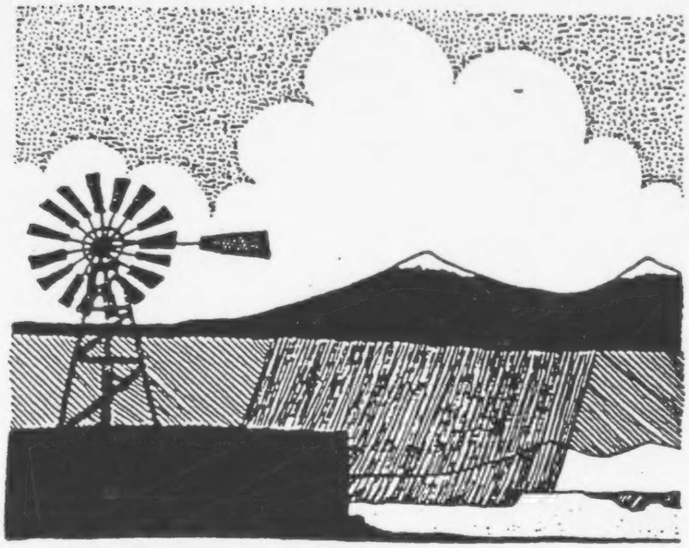
CHLORINATE
CHLORINE
CIRCULATING
CONSULTANT
ENZYMES
FECES
FLUCTUATION
FLUORIDE
INCUBATES
LAGOON
RECUPERATE
REPRESENTATIVE
RESIDUAL
STORAGE
SUBMITTAL
SUBMERSIBLE
SURVEYING

Answers


SUBMITTAL
SUBMERSIBLE
INCUBATES
CIRCULATING
STORAGE
RECUPERATE
SURVEYING
REPRESENTATIVE
RESIDUAL
FLUCTUATION
CHLORINE
FLUORIDE
LAGOON
ENZYMES
CHLORINATE
CONSULTANT
FECES

WHAT YOU DRINK IS WHAT YOU ARE: AN ANALYSIS OF DRINKING WATER

Student's Guide



Focus of Inquiry: How well do you know your drinking water? For example:

- -- When you drink water, do you know where it is from?
- -- Do you know what is in it?
- -- How do you know it is safe to drink?
- -- If you were in the environment, away from "civilization," how could you tell if the water is safe or how could you find water which is safe to drink?
- -- If in that situation, what techniques could you use to purify the water or make sure it is safe to drink?

In this activity you will find answers to those questions through your experiments in lab and by visits and outings with water experts. One of these experts will be from the tribal community -- someone who is familiar with traditional ways of finding or preparing water which is safe to drink. The other expert will be an employee from the public water system.

Why Is This Important?

- -- You will learn a type of survival skill which you may use one day to help you and/or others to live.
- -- You will be learning valuable techniques used by tribal members which

may offer new techniques to other scientists or water experts.

- You will be performing laboratory techniques which may help you in college or in your profession.
- You will become more aware of your drinking water and the system that brings it to you.
- You will add to your understanding of hydrology (the subject of water) on your reservation.
- Based on this activity, you may make recommendations to improve the water situation in your community if it is necessary.

Procedure:

Materials: clipboards, tape-recorder, equipment needed for the tribal method of water purification, graduated cylinder, collecting jars (plastic or glass), phenolphthalein, wide range and narrow range pH papers, pipettes or medicine droppers, 4% sodium hydroxide solution, safety goggles, 250 ml flasks with stoppers, solutions 1, 2, 3, 4 and 5 as described in lesson plan, "Going with the Flow III--Chemistry of the Stream" beakers.

Note: adequate eye protection is required in the laboratory.

For the first part of this activity, you will have two visitors to class and you will go out into the field with them. Both of them will have expertise with drinking water. One of them will be a member of the community who knows traditional ways of purifying water or of finding pure water in the local environment. He or she will explain these ways and demonstrate them either in class or in the field. The other visitor will be someone familiar with the local public water supplies. He or she will explain and show the system to you and how water remains pure in this system. He or she will also demonstrate procedures of this system either in class or when you go out into the field.

You will be taking notes or recording and transcribing (writing down) their talks.

WARNING: Since this is a laboratory experience, do not drink any of the water involved with this activity.

In the field ....

The tribal expert and the water system expert may accompany you into the field for demonstrations and guidance.

In sterile containers, you are to collect at least 300 ml of 4 water samples: one from a spring, one from a well, one before traditional water purification and one after traditional water purification. (If there is a judgment of good or bad water rather than a water purification technique, take one sample of what is considered "bad" water and one sample which is considered "good" water.)

Mark each jar with a number and, for that number, describe the water source below:

Sample 1: ____.

Sample 2: ____.

Sample 3: ____.

Sample 4: ____.

Sample 5: Tap water.

Sample 6: This will be distilled water you obtain in lab for the control in the tests you run on the above samples.

Back in the lab ....

1 For each sample, use a clean beaker which has been rinsed with distilled water. Pour approximately 100 mL of each sample into the individual beakers. Label the beakers. Using the wide range pH papers first, determine the pH of each of the 6 water samples. Then use the most appropriate narrow range pH papers for more accurate pH results. Record your findings on the pH graph on the data page.

2 Using the procedure in "Going with the Flow III--Chemistry of the Stream," determine the carbon dioxide content of your water samples. Record your results in the graph on your data page. Your teacher will let you know what to put on the vertical axis of your graph.

3 Using the procedure in the same activity, determine the oxygen content of your water sample. Record your results in the graph on your data page. Your teacher will tell you what to put on the vertical axis of your graph.

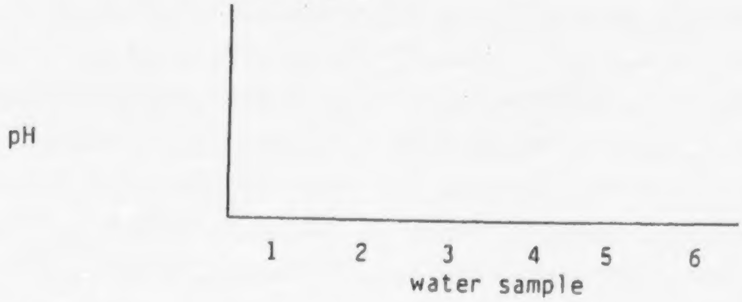
4 Determine the bacterial count of your water samples (both varied bacteria and coliform bacteria). Use the procedure in "Going with the Flow IV--How Clean is This Stream?" for bacterial plating and analysis starting at Step 2 "In the Lab ... " Record your results in the data chart on your data page.

5 Make wet mount slides for each of your water samples. Scan the entire slide and estimate the number of protists (one celled organisms) in the water. Use the following code for recording on your data chart: 0 = none seen; + = one or two seen; +++ = between 2 and 4 seen; ++++ = more than 4 seen.

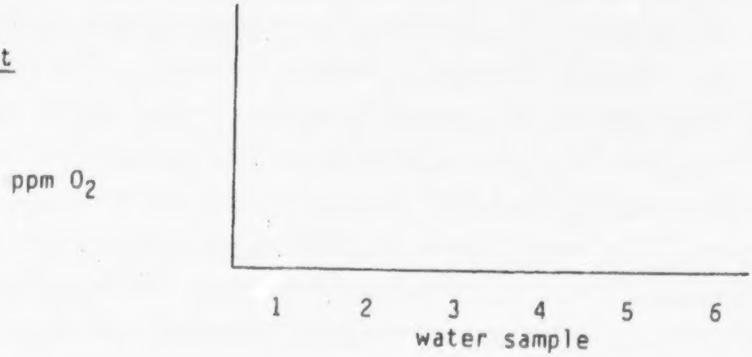
DRINKING WATER ANALYSIS

DATA PAGE

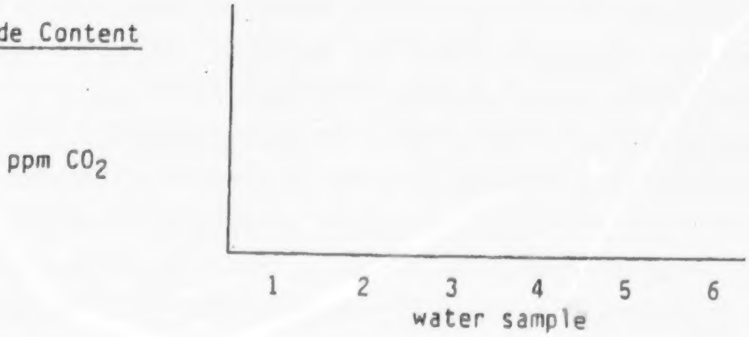
I. pH



II. Oxygen Content



III. Carbon dioxide Content



IV. BACTERIAL COUNTS

Dilution:		0	1:10	1:100	1:1000	1:10,000	1:100,000	1:1,000,000
Water sample	Agar Type							
1	N.agar							
	E.agar							
2	N.agar							
	E.agar							
3	N.agar							
	E.agar							
4	N.agar							
	E.agar							
5	N.agar							
	E.agar							
6	N.agar							
	E.agar							

V. PROTIST OBSERVATIONS

Sample #	Relative Count
1	
2	
3	
4	
5	
6	

Self Check: Do you know the following words? purify, hydrology, transcribe, distilled, data, bacteria, profile, liter, coliform.

1 For each water sample, write a paragraph describing that water based on your data. Discuss its pH, oxygen content, carbon dioxide content, bacterial count, and relative protist count. At the end, based on your description, answer these two questions? "Is the water fit for human consumption?" "Could a trout live in this water?"

Hint: Here are the Federal standards for drinking water. Bacterial content: water is considered consumable if it has 5 coliform bacteria per milliliter or less and 100 non coliform bacteria or less. Oxygen content: the range for a trout living in this water is: 4 to 7 ppm of oxygen (7 ppm for a healthy life, 4 ppm for a somewhat unhealthy but liveable life).

2 Rank the water samples in order. Start with the water you would most like to drink and end with the water you would least like to drink. Explain why you gave them this ranking. Support your answer with your data from your experiments.

3 What were the differences between the "before" and "after" samples of water having to do with traditional techniques?

4 If you had only one test to perform on water to determine its drinkability, which one would it be. Why?

5 Describe the scientific basis for traditional techniques of water purification or with traditional judgment of good/bad water.

6 Based on what you have learned in this activity, what would your recommendations be for improving the drinking water in your local environment? Support your ideas with reasons from the data of your experiment.

Going Further:

-- Bring water from home to run tests on if it is different from the water you used in this activity.
-- Research various illnesses which may come from drinking water.
-- Learn other methods of finding good water or purifying water when out in the environment.
-- Look into water-related issues on the reservation, in the state, and in the rest of the country.
-- Try some ideas and experiments on your own which may help improve the water in your community.
-- Try setting up a home water purification system.

Additional Resources:

-- Environmental health specialists
-- Chemists
-- Tribal, state or federal agencies responsible for water in the area
-- Individuals familiar with survival techniques in the "wilderness"

Related Careers: You may wish to consider the following careers because the techniques you've used in this investigation are used by the following professionals:

- Hydrologist
- Chemist
- Environmental Scientist
- Traditional Water Expert
- Geologist
- Environmental Health Expert for the Tribe

WHAT YOU DRINK IS PART OF WHAT YOU ARE: AN ANALYSIS OF DRINKING WATER
Teacher's Guide

Overview: In this activity, the student takes an extensive look at drinking water in the local environment. Water is considered very important both culturally and technically on reservations. The activity begins with class visits and then field trips with two water experts--an expert of the tribe and a conventional expert. Their talks and information in class are followed by demonstrations and sample collections in the field. Extensive lab work then takes place in which the students test the samples of water for pH, oxygen content, carbon dioxide content and bacterial content. The students then analyze and compare the various water samples and purification techniques for human use.

Objectives: The students will:

- -- Hear, observe and practice the traditional techniques and beliefs dealing with drinking water.
- -- Analyze the information and techniques involved in the public water system.
- -- Enhance their understanding of the larger picture of hydrology on their reservation.
- -- Possibly develop some survival skills in finding and preparing safe drinking water.
- -- Apply the laboratory techniques of pH determination, titrations, and bacterial plating.
- -- Make recommendations for improving the local drinking water.

Techniques and Information: You may wish to have the students draw up questions for the water expert guests before the visits to the class and the field outings. Based on the guests' presentations, note-taking, tape recording, translation and transcription can be done by the students for language arts benefits.

Since these laboratory procedures are rather complex, it benefits the students to repeat them so that the practice may improve their understanding and skills with these relatively sophisticated lab techniques.

Be sure to read both the student's version and the teacher's version of the lesson plan entitled "Going with the Flow III-Chemistry of the Stream" thoroughly, as several of the lengthy and complex procedures in this experiment are drawn from that activity.

Directions for preparation of all solutions for this activity are found in the Teacher's section of the activity, "Going with the Flow III--Chemistry of the Stream."

You may opt for using a commercial kit for this activity. Almost every major science supply catalogue has kits available; you'll find them listed in the index under "water testing."

In bicultural matters, you may wish to first contact a cultural liaison to discuss what possibly the students may learn from a traditional water expert.

Encourage the traditional member of the community to discuss or demonstrate: how to find pure water in the environment, how to purify questionable water, how to conserve water, the history of the tribe's water sources, and any traditional stories about drinking water.

You may encourage the person from the public water system to talk about the system itself, how the water is purified, tests which are done to monitor the water, how to conserve water and the future outlook for the water supply.

Each speaker should come to class on a different day and, preferably, go into the field with the students on different days as well. Be sure to plan the field outing in consultation with the guest water expert.

Determine which water samples will be collected during each field outing. Scout out the sites for water collection: well, spring, drinking water from tap, and the before/after traditional techniques applied to water. For the water sample reflecting traditional, tribal techniques, basically what you are trying to do is to get before and after water samples which flank the traditional practice for ensuring "good" water. The practice may either be an actual technical process of treating the water or using specific ways of judging good water. Basically then, if there is a traditional process, try it in the field or in the lab and compare water samples of before and after the process. If there are specific ways of judging good water, get a sample which is traditionally considered good and one traditionally considered bad.

The ranges on the Y ordinates of the graphs have been purposely left off so that you may set them up according to your local water samples and so that they will reflect as sensitive a range as possible. This then requires that you do some of the lab work before the students do and let the students know what scale should go on the y ordinate before they begin the lab.

Since there is so much lab work, you may wish to reorganize the lab and assign each team a sample. Then have the teams pool their information in class.

Warn the students that they are NOT to drink any of the water in this activity because the water may be accidentally contaminated in the source or by the laboratory equipment and dangerous chemicals.

Evaluation: The Objectives may be used as guidelines when you design your own evaluation to this activity. (Don't forget to evaluate non-academic skills such as technique, a "willingness" to try or teamwork.) You may wish to have the students answer the questions they find connected with the procedures taken from other activities. Answers to those are in their related teacher sections.

Answers to questions in students' evaluation section:

1 Look for good data and analyses of the data. Water is drinkable if equal to or better than the federal standard. Same as with the trout.

2 Depends on student's data. Explanations should make "scientific" sense.

3 Depends on the outcomes.

4 Hopefully it would be the bacteria or microscopic examination for protists. Then again, if there were chemical poisons in the water, bacteria and protists may not be able to survive in it. So perhaps this one is up for grabs for the students.

5 Open to student opinion.

6 Depends on outcomes -- up to student opinion. Try to encourage opinions based on data from the experiments.

Extension:

-- Students may wish to bring water from home to run tests on if their water is different from the water used in the activity.

-- Tie in knowledge of drinking water with water-related illnesses.

-- Students may wish to learn other methods of finding water or water purification when out in the environment.

-- Look into water-related issues on the reservation, in the state, in the rest of the country and in the world.

-- Try some ideas, experiments, or projects with the class which may help improve the water in your community.

-- Try setting up a water purification system.

Chuck Hanson

by Susan Brasgalla

Chuck Hanson was born in 1959 on the Leech Lake Reservation in Cass Lake, Minnesota. He is a member of the Minnesota Chippewa Indian Tribe, also referred to as Ojibwa (or Ojibway). He attended public school in Cass Lake from kindergarten through grade twelve. The enrollment in Cass Lake Public Schools is approximately 50% Native American.

After graduation from high school, Chuck chose to attend Brainerd Area Vocational Technical Institute to pursue a two year degree in the field of science. He had always been interested in science and nature and wanted to have a job where he could work outdoors doing science related activities. When he graduated from Brainerd AVTI he was employed by the Minnesota Chippewa Tribe as a water quality technician.

There are seven Chippewa reservations in the northern half of Minnesota: Leech Lake, Nett Lake, Red Lake, Mille Lacs, Fond Du Lac, White Earth, and Grand Portage. Chuck's job is water quality testing on all seven of the reservations. He tests the ground water before a builder is allowed to dig a well. If the water doesn't meet drinking water standards, the well must be dug somewhere else. Drinking water standards are maximum levels of certain chemicals thought to be safe. These chemicals include elements such as arsenic (As), barium (Ba), cadmium (Cd) and lead (Pb) and compounds such as benzene (C_6H_6). Elements all have chemical symbols which can be found on a chart called a Periodic Table. Compounds, such as benzene, are made up of two or more elements. Benzene is made up of carbon and hydrogen.

Chuck must use special equipment to dig down to get a water sample. Sometimes he digs through black dirt or sand and sometimes through gumbo (clay), loose rock, or solid rock. If the material is too difficult to dig through then he must use a drill. After a well is constructed the water sample is then tested in a laboratory to see if it is pure enough to drink and if there are any chemicals in it that should not be there.

Chuck also tests water around sewage facilities and septic tanks to make sure no impurities are going into the drinking water.

Chuck keeps an eye on water levels in lakes too. The Chippewa people harvest wild rice and in order for it to grow, a specific water level must be maintained. Drought conditions can severely damage the wild rice crop and whenever possible water is pumped to the low rice beds from nearby lakes and streams.

The town of Cass Lake is right next to a lake of the same name. Cass Lake is one of the lakes on the Mississippi River chain. The Cass Lake area has been designated as a target area to receive a Super-Fund allotment for cleanup of the lake. Super-fund legislation was passed in 1980 to provide for clean up of hazardous waste sites. A number of years ago there was a Champian Lumber Company that used a treatment on its wood products. Right next to the company was a settling pond where a large amount of chemicals from the wood treatment collected. The settling pond was half a mile from a channel that connected Cass Lake to Pike Bay, a neighboring small lake. Chemical contaminants got into the lake and also into the Mississippi River. Pentachlorophenol, a chemical that was once used to treat (preserve) wood, was one of the contaminants. The production of this chemical has now been outlawed because it is a known carcinogen (causes cancer). As a result of all this, Chuck must now test the lake water on a regular basis to monitor contaminant levels. He also checks wells in the immediate area and makes sure strict guidelines are followed to insure safe drinking water. People drilling new wells there have to be especially careful to make sure they have water they can drink.

The largest part of Chuck's job involves a fishery owned and operated by the Leech Lake Band of Chippewa Indians. Chuck works with them monthly to test their water. The fishery has three six foot wells that are hundreds of feet deep to supply the water to their holding tanks. There is an agreement between the State of Minnesota and Leech Lake that allows the fishery to harvest rough fish. Rough fish are non-game fish such as suckers, bullheads, red horse, and burbot that have no limit on numbers caught. They keep these fish in the live holding tanks and Chuck must check the water in the tanks to make sure the pH levels (levels of acidity and alkalinity) are correct and that it is kept clean enough to keep the fish alive. The pH scale is a scale which indicates acidity and basicity or alkalinity. Acids are sour substances that contain a hydrogen ion (H+). Bases are slippery substances that contain a hydroxyl ion (OH-). A pH of 1 to 6 indicates acidity (the lower the number the stronger the acid), 8-14 basicity (the higher the number the stronger the base) and 7 neutral. The pH scale is logarithmic which means that every number is ten times greater (or less) than the number before it and ten times less (or greater) than the number after it. For example, water with a pH of 5 is ten times more acidic than water with a pH of 6 and ten times less acidic than water with a pH of 4. Water with a pH of 11 is ten times more basic than water with a pH of 10 and ten times less basic than water with a pH of 12.

The workers at the fishery milk the fish for eggs. When the eggs hatch they use the small fish to restock area lakes. The water in the hatchery has to be strictly monitored by Chuck to make sure healthy baby fish can be born and survive to be released.

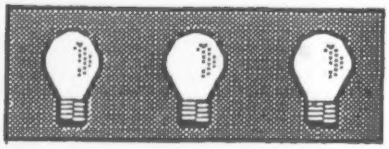
Most of the people that work at the fishery are Chippewa Indians like Chuck and many of them use science in their jobs. John Ringly, the director of the fishery, has a college degree in aquatic biology.

Brenda Northbird is in charge of the net making. The fishery makes different nets for different purposes to sell to people who fish. The nets are made of nylon and pointed weights and they are all hand tied. A trap net is used to capture fish like bullheads when they are ready to spawn so they can be milked for their eggs. Gill nets are to catch game fish like walleyes and northerns.

There are also many Indian loggers that work to bring wood to the fishery. The water is heated for the hatchery in a boiler by burning the wood.

Chuck has to keep a close eye on the sewage system at the fishery plant. They process over 35,000 pounds of rough fish per year and have a lot of waste materials. Fish scales can plug up the sewage system. If a plug up happens, water from farm wells in the area can become unfit to drink. It's part of Chuck's job to see that this doesn't happen.

In a normal month Chuck gets to drive around one of the most beautiful states in the United States to collect his water samples. He sees the seasons change and enjoys the wildlife. He spends a lot of time with nature and uses science in his work. Life is going pretty much according to Chuck's plan.



CONTENT QUIZ

1. What does Chuck Hanson Do?
2. What tribe does Chuck Hanson belong to?
3. How much education after high school did Chuck have to have to become a water quality technician?
4. What is the name of the place where they keep fish alive for milking?
5. What is important about Chuck's job with the hatchery?
6. Name the four things Chuck may need to dig through to get water samples.
7. Based on the story do you think Chuck enjoys his job?
8. Name two rough fish.
9. What does Brenda Northbird do at the fish hatchery?
10. Where does Chuck do his work?

Match the numbered items on the left with the correct definition on the right.

1. water control technician
2. vocational technical institute
3. laboratory
4. water table
5. rough fish
6. fishery
7. hatchery
8. milking
9. contamination

a. non-game fish

b. process of getting eggs from fish

c. person who tests water

d. place where fish are kept to be milked and processed

e. bad things like chemicals and pollutants that can get into the air and water

f. place where water samples are tested

g. school that offers two year courses

h. place where baby fish are kept

i. the level underground where water collects

GOING WITH THE FLOW IV
How Clean Is This Stream?
Student's Guide

Focus of Inquiry: Is there bacteria in your stream, and if so, how much bacteria is in the water?

How clean is your stream? By doing this research activity, you'll find out! You will be collecting many different water samples from your local stream and testing them for the concentration of bacteria in the water. You will test for bacteria in general, and specifically for coliform bacteria. Coliform bacteria are bacteria that normally live in the human intestine. The presence of coliform bacteria such as E. coli is evidence of sewage pollution. This may indicate the possible presence of bacteria that can cause serious illness.

You will find out how much bacteria is in the water by growing the bacteria on agar plates. There is a special ingredient in one of the types of agar which reveals the coliform or E. coli bacteria.

You will use your findings to analyze the extent of pollution in your stream in several ways. First, you will detect differences in bacteria at different sites along the stream. Then you will uncover possible human effects on the types and amounts of bacteria in the stream. Finally, you will analyze the effects bacteria may have on other biotic and abiotic factors in the stream's community.

Why Is This Important? You may find this activity important to do because:

- You will have a better idea of the degree of pollution in your stream.
- If there is pollution, you are in a better position to do something about the pollution by having statistical information about it.
- You will practice some lab techniques which you may use some day in college and/or professionally.
- You may prevent the spread of disease in your community by your awareness and action about bacteria in the stream.

Procedure:

Materials: 12 sterile bottles for water sample collection, glass marking pencil, 56 Petri dishes containing nutrient agar, 56 Petri dishes containing Endo agar, 13 sterile pipettes, distilled water, 13 sterile beakers (any size), 10 mL incubator, colony counter (optional).

In the field:

1 Using sterile collecting bottles, collect samples of stream water from each of your 7 sites at your stream station. Label each bottle according to which site it is from, along with your initials. Then, along the stream at a variety of different sites chosen by your teacher, collect 5 more samples. Label each of these bottles S-1, S-2 etc. Describe the important characteristics of the sites below:

Site 1: ____________________

Site 2: ____________________

Site 3: ____________________

Site 4: ____________________

Site 5: ____________________

In the laboratory:

2 For each sample, and for a distilled water control, organize 7 Petri dishes of nutrient agar and 7 Petri dishes of Endo agar. Label each dish with the water sample it will be for, and label each dish in preparation for the dilutions of the water sample inoculations it will receive. Refer to the data chart you will be using on the following page. (Each sample and the control will have 14 plates prepared for it: 7 of nutrient agar; 7 of Endo agar. So there will be 8 samples x 14 plates = 112 plates total.)

A Why is it necessary to start with sterile glassware in this experiment?

3 Using a different sterile pipette for each water sample and the distilled water control, transfer 1 mL of each water sample and the control to its appropriate 0 dilution Petri dish of nutrient agar. Do the same for the 0 dilution dishes of Endo agar. Gently swirl the inoculum over the agar to distribute it evenly. Rinse each pipette with distilled water and return the pipette next to its water sample.

B Why is it important to use the same pipette with the same sample all the time?

4 Label 13 sterile beakers with the names of the 13 water samples.

5 To make the first dilution, take 1 mL of the water sample, using its own pipette, and place it in its sterile beaker. (Remember to rinse the pipette with distilled water.) Add 9 mL of distilled water from a sterilized graduated cylinder. You now have a 1:10 dilution of the water sample. Repeat this procedure with each of the other 12 water samples and the control.

6 Using the 1:10 dilutions of the water samples you just created, inoculate the appropriate Petri dishes as you did in step 3.

7 Take 1 mL of the 1:10 dilution of each water sample from its beaker. Rinse the beaker with distilled water. Put the 1 mL of the 1:10 dilution back into the beaker and add 9 mL of distilled water. If you just diluted a 1:10 dilution by 10 again, you now have a 1:100 dilution. Right? Inoculate the appropriate Petri dishes with this dilution.

8 Repeat the dilution/inoculation steps. You will finish with the 1:1,000,000 dilution stage.

C Even though the beakers and pipettes were used for their own water samples, why was it important to rinse the beakers and pipettes each time you used them?

9 Incubate the plates for 48 hours at 35-37 degrees Celsius.

WARNING: NEVER OPEN THE PLATES!

10 Examine the plates for bacterial growth. You will now count the colonies (using a colony counter?) and record on your data chart in the corresponding squares. For the nutrient agar, count all the different colors and types of colonies. In the Endo agar, you are looking only for coliform bacteria. They will appear dark red with red coloration of the surrounding agar. Count only the coliform bacteria fitting this description.

NOTE: If in any of the plates the colonies are too numerous to count, write in the appropriate place in your chart, TNTC (too numerous to count). If there are no colonies, simply write 0 in the appropriate place on your chart.

11 Return the plates to your teacher, who will dispose of them safely.

12 Calculate the concentration of bacteria per mL of each water sample and record in your data chart of results. To do this, for each water sample or the control choose the dilution that produced the "most easily countable" bacterial colonies. (Your teacher will advise you on this.) Note the dilution for that plate. You want to figure how many bacteria there would be in one mL of the original water sample. So, if you know there are a certain number of bacteria in your countable dilution sample, then you need to multiply the number of bacteria so it would reflect how many bacteria are in the sample with no dilution:

# bacteria x 10^n = # of bacteria in 1 mL of original sample
(where n = power of 10 of the dilution you used)

For instance, if you found in the 1:1000 dilution that there were 32 colonies, then: (Remember 1000 is 10^3)

$32 \times 10^3 = 322{,}000$ bacteria per mL

Do all of your calculations in the spaces of your calculations page. Do the calculations for each water sample and each type of agar. That will be 8 water samples (including control) x 2 types of agar = 16 sets of calculations.

13 Enter the results in your data chart of results.

****

Sample name: ____

Agar type: Nutrient Agar or Endo Agar? ____________________

Bacteria type: (circle one): varied coliform

Dilution of plate with most countable bacteria: ________________

#of Bacteria in that plate = ________________

Calculations:

Result: ________________ coliform / varied bacteria per ML of sample

****

Use the above format for all the rest (15) of your calculations.

DATA CHART

Dilution:	0	1:10	1:100	1:1000	1:10,000	1:100,000	1:1,000,000
Water sample	Agar Type	$1:10^1$	$1:10^2$	$1:10^3$	$1:10^4$	$1:10^5$	$1:10^6$
Plot 1	N. agar						
	E. agar						
Plot 2	N. agar						
	E. agar						
Plot 3	N. agar						
	E. agar						
Plot 4	N. agar						
	E. agar						
Plot 5	N. agar						
	E. agar						
Plot 6	N. agar						
	E. agar						
Plot 7	N. agar						
	E. agar						
Site 1	N. agar						
	E. agar						

Dilution	0	1:10	1:100	1:1,000	1:10,000	1:100,000	1:1,000,000
Water Sample	Agar Type	$1:10^1$	$1:10^2$	$1:10^3$	$1:10^4$	$1:10^5$	$1:10^6$
Site 2	N. agar						
	E. agar						
Site 3	N. agar						
	E. agar						
Site 4	N. agar						
	E. agar						
Site 5	N. agar						
	E. agar						
Distilled Water	N. agar						
	E. agar						

CHART OF RESULTS

BACTERIA per mL:

SAMPLE NAME	Nutrient Agar (total bacteria)	Endo Agar (coliform bacteria)	% of total bacteria which is coliform (just divide total bacteria by coliform)

Self Check: Do you know the following terms? coliform bacteria, nutrient agar, bacterial colony, incubator, sterile, control (noun), inoculate, dilution.

1 Which water sample had the highest count of coliform bacteria?
Why do you think this is so?

2 Which water sample had the highest count of varied bacteria?
Why do you think this is so?

3 Did the control show any evidence of bacteria?
If so, where do you think these came from?
To obtain a true count of bacteria in all the water samples, do you think it would be correct to subtract the numbers of the controls's bacteria? Why, or why not?

4 Were there any differences in coliform bacteria between the "upstream" and "downstream" sample sites?
Explain with numerical examples from your data.

5 Do you think that there could be differences in the number of bacteria between sections of the stream which were fast moving and slow moving? Explain.

6 Were there major differences in the bacteria count of the samples from your sample plots along the stream? If so, were they between the coliform or varied bacteria or both? (Support your answer with numerical data.)

7 If the governmental standard for drinking water were 100 bacteria per ml., would the stream be drinkable as is? (Support your answer with numerical data.)

8 What could be done, in terms of reducing bacteria, to improve your stream's water quality? Give sample bacterial concentrations which you believe would be acceptable to have in the stream.

9 How do you think bacteria affect other biotic and abiotic factors in the stream's ecosystem? (Look through past activites of the stream for ideas about these factors.)

Going Further:

-- Stain and observe the bacteria under the microscope
-- Attempt using a strict, sterile technique and compare results.
-- Test for gram + and gram - bacteria.
-- Try ideas and experiments for cleaning up the stream and retest for bacterial counts.
-- Try a community campaign to change human habits which pollute the stream (contact appropriate authorities), or try a personal campaign by simply writing letters.
-- Look into the connection between local illnesses and disease and the bacteria in the stream water.

Additional Resources:

-- Microbiologists
-- Environmental health departments and specialists
-- Medical professionals (both traditional and conventional)

Related Careers: You may wish to consider the following careers because the techniques you've used in this investigation are used by the following professionals:

-- Bacteriologist
-- Ecologist
-- Biologist
-- Hydrologist
-- Enviromental health specialist

GOING WITH THE FLOW IV:
How Clean Is This Stream?
Teacher's Guide

Overview: The students will analyze and compute the bacteria found at their stream plots and at five other sites along the stream. The point of the activity will not only be to see proof of the bacteria in the stream at their plots and to analyze the ecological relationships of bacteria to the environment, but also to see relative differences in the amounts and types of bacteria according to human influences along the course of the stream. The entire spectrum of bacterial types will be studied and a focus on coliform bacteria will be made.

This activity will be somewhat challenging to the students for the complex lab techniques it calls for.

Objectives: The students will:

- Identify the bacteria that exist in the stream, the role it plays in the stream's ecosystem, and the effects humans have on the bacteria in their local stream(s).
- Prepare a series of 7 dilutions of the samples and plate out the dilutions on two types of agar.
- Analyze, count, and calculate the growth of bacteria per mL of water sample.
- Distinguish and analyze the types of bacterial growth with particular emphasis on coliform bacteria.
- Interrelate the amounts and types of bacteria with other abiotic and biotic (particularly human) effects on the environment.

Techniques and Information: This activity is so complex (procedurally) that it probably needs a good, conceptual introduction and talk about dilutions, selective agar plating, and coliform bacteria.

Demonstrating the procedure is highly recommended.

Students will sample from 7 plots at their stream stations and 5 sites you choose along the stream which may reflect differences in bacteria due to human influences: Choose sites such as a site upstream to human habitation; a site downstream to human habitation; a site near a septic tank or sewer outlet; a site near agricultural use; etc. If the stream does not pass through inhabited areas, choose one that does for your 5 site samples, such as at a nearby town or city.

Remind the students that one colony started with one bacterium and to choose the plates for numerical analyses which would be the most countable--those with distinct colonies and a good number, of say 10 to 40.

To cut down on time or supplies, you can make your own culture plates; OR just do 5 water samples from various sites along stream instead of including the 7 stations from the students' sample stream plots; OR have the class work in 8 teams, with each team responsible for one sample.

Endo agar is used specifically for indicating coliform bacteria. Nutrient agar will reveal the range of many different types of bacteria. You may substitute Endo agar with eosin-methylene blue agar. If using eosin methylene blue agar, cross out all Endo agars mentioned throughout the lesson plan. The evidence of coliform bacteria on eosine methylene blue agar is that it grows with a flat surface and a greenish metallic sheen.

WARNING: Students should use caution when handling the cultures, since E. coli is pathogenic in certain body regions and tissues. They should never open the plates. Taping the edges is recommended.

Evaluation: The Objectives may be used as guidelines when you design your own evaluation to this activity. (Don't forget to evaluate non-academic skills such as technique, a "willingness" to try or teamwork.)

Answers to student questions during the procedure:

A It is important to use sterile glassware so that no bacteria are introduced into the cultures from the glassware, rather than the water sample itself. Contamination will affect the results.

B It is important to keep the pipette with the same sample so that bacteria from other samples do not get mixed with it.

C It is important to rinse them so that bacteria from a more concentrated dilution do not enter the new dilution. Again, another form of contamination.

Answers to students' questions in their Self Check section:

1 Depends on actual samples used. May be due to human influences.

2 Depends on actual samples used. Reasonable concentration/check data sheet. May tie in with human influences or slow movement of stream, or naturally decaying organic matter.

3 This will depend on the sterility of the water. Came from either the water or the air.

Yes. Because the bacteria would have been coming from the distilled water rather than the water sample. If you subtract the control, you will get a more accurate count of bacteria just from the sample rather than the distilled water.

4 This will depend on your sites. Data should be higher downstream than upstream. Reason: the organic matter humans put into the stream give "food" for bacteria to live on. More human organic matter downstream.

5 Yes. Fast flow moves bacteria along too fast to stay and grow on nutrient substances.

6 Depends on results.

7 If concentration of student data is higher than standard: nondrinkable. If lower than standard: drinkable.

8 Concentration of bacteria should be lowered by putting in less "pollutants" on which the bacteria feed or live. Putting in less could include: stop dumping garbage; stop agricultural runoff; stop septic tank leakage into; stop sewers entering. Clean up debris or anything to make stream move faster. Bacterial concentrations given should make sense and perhaps relate to the governmental concentrations for drinking water.

9 Should relate to taking up the oxygen, giving off carbon dioxide--result in less animal life, more plant life, such as algae. Breaks down organic "stuff" in water. Blocks off light? Poisonous to animal life; enters their systems? Changes the condition of the bottom of the stream?

Extension:

-- Stain and observe the bacteria from the colonies under the microscope using sterile techniques.
-- Attempt using the strict sterile technique and compare results.
-- Test for gram + and gram -.
-- Try ideas and experiments for cleaning up the stream and retest for bacterial counts.
-- Try a community campaign to change human habits which pollute the stream (contact appropriate authorities); work with social studies classes in this effort.
-- Look for other organisms in the stream that would be from the human intestine.

Procedures adapted from:

Hummer et al.: Probing Levels of Life - A Laboratory Manual, 1976. Charles E. Merril Publishing Co. Columbus, OH.

SCIENCE STANDARDS ADDRESSED IN WATER UNITS –

Standard – Understands the main individual, social, ethical and institutional aspects of science

Benchmarks –

Understands that the traditions of accurate record keeping, openness, replication and peer review keep the majority of scientists within the bounds of ethical behavior; violations of this behavior are eventually exposed and strongly condemned

Standard – Knows basic concepts about the earth

Benchmarks –

Knows that life is adapted to conditions on earth, including the strength of gravity to hold an adequate atmosphere and an intensity of radiation from the sun that allows water to cycle between liquid and vapor

Knows that solar radiation – direct and through the winds and rivers it creates on the earth's surface – is continually available, and can be transformed into electrical energy, which is then distributed widely for lighting, heating, and running machinery

Standard – Understands how species depend on one another and on the environment for survival

Benchmarks –

Knows that like many complex systems, ecosystems have cyclic fluctuations around a state of rough equilibrium

Knows that ecosystems always change when climate changes or when very new species appear as a result of migration or evolution (or are introduced deliberately or inadvertently by humans)

Standard – Understands the cycling of matter and flow of energy through the living environment

Benchmarks –

Knows that the amount of life any environment can support is limited by the available energy, water, oxygen, and materials, and by the ability of ecosystems to recycle the residue of dead organic materials

Standard – Understands how germ theory differs from earlier notions about what causes illness and how germs were discovered and linked to disease

Benchmarks –

Knows that today, high-power imaging and biotechnology make it possible to investigate how microorganisms cause disease, how the immune system combats them, and how they can be manipulated genetically

Knows that Pasteur showed that microorganisms were involved in animal disease

Standard – Understands what constitutes a system and how the idea of systems is used in different contexts

Benchmarks –

Knows that understanding how things work and designing solutions to problems of almost any kind can be facilitated by systems analysis

Knows that in defining a system, it is important to specify its boundaries and subsystems, indicate its relation to other systems, and identify what its input and its output are expected to be

Knows that the feedback of output from some parts of a system to input of other parts can be used to encourage what is going on in a system, discourage it, or reduce its discrepancy from some desired value, thus the stability of a system can be greater when it includes appropriate feedback mechanisms

Knows that only in very simple systems (and not all of them) is it possible to predict what the result of changing some part or connection will be

AMERICAN INDIAN STANDARDS ADDRESSED IN WATER UNITS –

Physical Science

Indian students should develop an understanding of structure and properties of matter and be able to discuss analogies/differences between empirical and traditional American Indian concepts about matter; for example, discussing the interactions of energy and matter in relation to the traditional representation of earth, air, fire and water as parts of the Medicine Wheel.

Life Science

Indian students should develop an understanding of how atoms and molecules cycle among the living and nonliving components of the biosphere and be able to relate these to traditional tribal paradigms such as the Circle of Life, the Beauty Way, the Red Road, etc.

Indian students should develop an understanding of the fundamental tension between living organisms' capacity for infinite growth and the finite nature of environments and resources and to relate knowledge of this tension to traditional American Indian values about ecology.

Science in Personal and Social Perspectives

Indian students should develop an understanding of factors – including cultural beliefs and values, historic/contemporary practices – that contribute to their tribe or community's overall health.

History and Nature of Science

Indian students should develop an understanding of science as it is practiced by American Indian scientists and science/technology related professionals in their communities.

Indian students should develop an understanding of various opportunities for science careers.

Indian students should develop an understanding of American Indian contributions to science in such areas as medicine, botany, psychology and ecology.

HEALTH

American Indian people suffer from the effects of diabetes, especially, at an alarming rate. They need to be aware of requirements to maintain good health and must have good health care. Indian people also have access to health remedies handed down through Medicine People. Many of the medicines used in the modern health field today were first used by Indian people. Indian Medicine People have been called upon by the National Institute on Health to help with finding cures for cancer, Aids, etc.

Alcoholism/drug addiction is another of the most serious health problems facing the Indian people today. This fact is now clearly recognized both by Indian leaders and by the Indian Health Service. A task force of the Indian Health Service suggested this definition for alcoholism: "A disease, or disorder of behavior, characterized by the repeated drinking of alcoholic beverages which interferes with the drinker's health, interpersonal relations and/or economic functioning." Some view addiction as a disease and cite findings that show a biological basis for it. Others see it as rampant among Indian people as the result of intergenerational trauma. Whatever the cause, the majority of suicides, murders, accidental deaths and injuries among Indians are associated with it, as are many cases of infection, cirrhosis and malnutrition. By far the majority of arrests, fines and imprisonments of Indians are the result of addiction. The associated loss of productivity and the resulting abnormal social adjustments are by-products of considerable importance. Addiction among Indian people is a problem that deserves the best efforts of everyone working together to address the urgency of the situation. Many Indian people who have become addicted have been helped to stop using through treatment programs and/or Indian spirituality.

LITERATURE FOR HEALTH UNIT –

Susan LaFlesche Picotte, MD by Benson Tong.

Native American Doctor by Jeri Ferris.

Carlos Montezuma by Peter Iverson, Raintree, 1990.

From Deep Woods to Civilization by Charles A. Eastman (**Indian Author**).

Healers, American Indian Lives Series, available from Four Winds Indian Books, York, NE.

James Joe, **Navajo** Medicine Man by Susan Thompson.

Gift of Power: The Life Teachings of a **Lakota** Medicine Man by Archie Fire Lame Deer **(Indian Author)**.

Fools Crow by Thomas E. Mails, University of Nebraska Press, 1979.

The Seven Visions of Bull Lodge by George P. Horse-Capture (**Indian Author**), Bison Books.

A People's Ecology ed. by Gregory Cajete (**Indian Author**), Clear Light.

How Indians Use Wild Plants for Food, Medicine and Crafts by Frances Densmore.

Teachings of Nature by Adolph Hungry Wolf (**Indian Author**), Book Pub. Co., 1989.

Cherokee Plants: Their Uses – A 400 Year History by Paul B. Hamel & Mary U. Chiltoskey, Book Pub. Co.

American Indian Medicine by Virgil J. Vogel.

Earth MedicineEarth Food by Michael A. Weiner.

Indian Doctor available from Four Winds Books, York, NE.

Indian Herbology of North America by Alma Hutchens.

The Heart of a Chief by Joseph Bruchac (**Indian Author**).

The Death of Jim Loney by James Welch (**Indian Author**), Penguin, 1979.

The Sacred Tree, Four Worlds Development Project, 1984, 403-320-7144.

Wounded Warriors: A Time for Healing by Dr. Doyle Arbogast.

The Broken Cord by Michael Dorris (**Indian Author**).

Honour the Sun by Ruby Slipperjack (**Indian Author**), Pemmican Pub.

I Have Spoken: American History Through the Voices of the Indians by Virginia I. Armstrong, Swallow Press, 1971. Contains Indian oratory concerning use of alcohol.

Poetry: Muted War Drums by Adrian C. Louis, Better to Avoid Her by Luci Tapahonso, Houston and Bowery, 1981 by Diane Burns, Song-Maker by Anita Endrezze-Danielson (**Indian Authors**).

Where the Rivers Meet by Don Sawyer, 1988.

Halfbreed by Maria Campbell (**Indian Author**), 1973.

American Indian Life Skills Development Curriculum by Theresa LaFromboise, Univ. of Wisconsin Press, 1996.

ACTIVITIES FOR UNIT -

1. Have the students learn about health issues, read cultural materials and hear cultural perspectives relating to this topic.
2. Have the students do research to find statistics relating to the incidence of diabetes nationally and locally. Compare them. Chart the findings.
3. Have the students read about an early Indian doctor, a Medicine Person, and about Indian medicines.
4. Have the students do research to find statistics relating to alcohol and drug abuse nationally and locally. Compare them. Chart the findings.
5. Have students do research to find information relating to studies and findings regarding cause and treatment of addiction and diabetes.
6. Have students read oratory, novels or poetry including effects of substance abuse and addiction.
7. Have the students visit and learn about local programs and efforts to address health and wellness.
8. Have the students invite professionals to come to the class to speak on the topics of diabetes and addiction.
9. Have students write personal narratives about how diabetes and substance abuse/addiction affects their community.
10. Have the students draw conclusions and discuss their conclusions in a talking circle.

Following are materials and example activities for three units developed by teachers of Indian students who attended the MASTERS Project at the University of Kansas and math and science workshops at Haskell Indian Nations University, and by the Outdoor World Science and Mathematics Project at Northern Arizona University. Adapt these activities to meet your students'needs. Review the science standards for this unit. They will suggest further science and math activities.

Dwayne Deegan

by Nancy Larson

Imagine, if you can, in this age of technology, a health professional who still makes housecalls! A myth? No, there are still people in the medical field interested enough in and willing to go to the people, instead of waiting for the people to come to them. Dwayne Deegan is such a person.

Dwayne Deegan is a member of the Fort Totten Sioux Indian Tribe in North Dakota. He is also a public health nurse for the entire reservation. In his own words, Dwayne says, "my work takes me from one end of the reservation to the other. I am responsible for all the Indians that live here. I go to homes, schools, and sometimes even to the stores. I go wherever I have to go to find my poeple who need help. I help them wherever, whenever and however I can."

Although Dwayne likes his job, he has not always been in this line of work. While in the Army for ten years, he was assigned to a hospital and found he enjoyed taking care of sick people. When Dwayne left the Army he decided to go to college to become a nurse. To become an R.N. (Registered Nurse) Dwayne had to spend four years in college.

In college, Dwayne learned all about how the human body works. He studied the major organs like the heart, lungs, brain and kidneys which are part of the following body systems: the circulatory, respiratory, nervous and excretory systems.

When he completed his college degree in nursing, it only seemed natural for Dwayne to return to North Dakota, the place he knows as home. His father was born and raised on the Fort Totten Sioux Reservation, so he was familiar with the land and its people.

Public health nurses work in the community, not in hospitals. Dwayne visits homes and schools to educate people about health care concerns that effect them directly. The topics that he discusses most frequently are aerobic conditioning, well balanced diets, heart disease, communicable diseases, and diabetes. Dwayne feels that these are the major health concerns of his people at this time.

Much of the care Dwayne gives is without direct supervision of a doctor; he has his own caseload of patients and is responsible for their plan of care. Because he cares for all ages, babies, moms and dads, and the elderly, Dwayne must know a lot about health care.

A very good indicator of general health condition is pulse rate. Pulse is the rhythmical throbbing of the arteries produced by the regular contractions of the heart. Your pulse can easily be felt at certain points on the body where the arteries are close to the surface. The wrist is a good pulse point. Dwayne encourages his patients to check their pulse rates regularly. He tells his patients about the value of aerobic conditioning and how changes in pulse rate can be used to indicate levels of fitness. By exercising regularly you can increase the efficiency of your heart to deliver needed oxygen to your body's blood cells. Thus, as you exercise and get in shape you become more physically fit and your heart becomes stronger and your pulse rate drops because your heart can deliver the necessary oxygen with fewer beats than when you were in poor physical condition. (Remember the oxygen (O_2) you need is in the air. Air is approximately 20% oxygen and 80% nitrogen (N_2). It contains about .03% carbon dioxide (CO_2). The air that you exhale from your lungs contains about 4% carbon dioxide and about 16% oxygen.) Dwayne also knows that pulse rate varies with body size and age and therefore all of his patients cannot use the same pulse rate guidelines.

Dwayne talks about how important a well balanced diet is in helping to maintain good health. Dwayne tells his patients that it is important to eat foods from the four basic food groups at every meal. He reminds them that the four food groups are 1.) meats, 2.) fruits and vegetables, 3.) breads and cereals (grains) , and 4.) milk, eggs and other dairy products.

He also tells them about low-cholesterol diets and recommends specific foods which are low in cholesterol. Dwayne explains that cholesterol is a fatty substance found in all animal tissues. The human body makes most of its own cholesterol but some enters the body in foods such as butter, eggs, fatty meats and organ meats (brain, liver, etc.). The body needs cholesterol but too much cholesterol can cause hardening of the arteries (arteriosclerosis). This happens when fatty deposits containing cholesterol collect on the inner walls of the arteries and slow blood flow, increasing the opportunities for blood clots to form. If a blood clot blocks an artery of the heart it can result in a heart attack. Many health professionals recommend a diet low in cholesterol and saturated fats as they cause the body's production of cholesterol to increase.

Dwayne also teaches his patients about communicable diseases.

Communicable diseases are contagious diseases, diseases that can be transmitted or spread from one person to another. Colds and flu, measles and mumps are among the contagious diseases that Dwayne talks about. Although he does get involved in home nursing (such as changing dressings, etc.) his main concern is teaching people how to keep healthy and avoid diseases.

Dwayne visits five to six homes each day. He examines anyone who is sick, answers questions, sets up clinic appointments and does whatever else he can to help meet his patients' needs. If no one is sick, he will spend time teaching the people how to stay healthy.

Included on his list of visits are people who must take medication regularly. He checks the pills to be sure they are being taken as the doctor prescribed.

Among his patients are a number of diabetics. People with diabetes have to take insulin, a hormone, that helps to control how cells use sugar in the blood. Some diabetics can take oral medication but others must inject (give themselves a shot with a hypodermic needle) the needed insulin. Diabetics do not have enough insulin in their bodies. If the body does not have enough insulin then too much sugar builds up in the blood. This condition is called diabetes. Insulin is produced by the pancreas, an organ which is also an endocrine gland (endocrine glands are glands in the body that produce hormones) located behind the stomach. Diabetics have a dysfunctional pancreas. A simple urine test will tell you whether or not you have sugar in your urine. Normally, there should be no sugar in the urine and diabetics test their urine to be sure that the dosage of medicine that they are taking is sufficiently controlling the sugar in their blood. Dwayne demonstrates the test tape which has a sugar color indicator in it and makes sure that his diabetic patients know how to use it, how frequently to test their urine and how to interpret the color results of the test.

Dwayne has a great need for science as he uses it every day in his work. It was very important for him to take many science courses in college to become a nurse; microbiology was his favorite. Here he learned all about germs (which are microorganisms to scientists). Microbiology means the study of (ology) living organisms (bio) that are too small to see with the unaided eye (micro). He says, "germs are like insects - some are good and some are bad. Much of my work is with the bad germs, the ones that make us sick. These germs are called pathogens." Pathogens cause communicable diseases.

Dwayne encourages everyone to become involved with learning about science. He says, "we all use science every day - riding the school bus, driving a car, the food we eat, the TV we watch, this is all science."

Just as science is important, Dwayne feels family is also important. He says, "Family is always important. You cannot survive without family. All Indians know this. That is why we have so many cousins, grandmas and aunties." Both Dwayne and his family are very active in community and cultural events. He likes to go to pow-wows to watch his six-year-old daughter dance, and to work with the flags. He is a veteran, and only veterans are allowed to work with the flags. Also, as a member of the Fort Totten Veterans

Club, he helps with school and church activities. When asked what he likes about the community where he and his family live, Dwayne replies, "I'm from North Dakota and I love it. I like living in the country. My dad was born and raised in Tokio, so this is home for me."

Dwayne is very serious about maintaining the health of his people, but every now and again he runs into a situation even he cannot help laughing at, such as this experience: A woman telephoned Dwayne and told him her son had hurt his eye on a tree branch, and wanted to know if she could put her eyedrops in his eye. When Dwayne asked, "What kind?" she replied, "How do I know what kind of tree it was?!"

This story is funny, but it also represents a bond of trust between Dwayne and the people he cares for. Those people that would feel afraid to call a "real" doctor would not be afraid to call someone they feel is their friend and neighbor. In doing his job, Dwayne is filling a great need on his reservation as well as making a lot of friends.

ACTIVITIES

1. Have the class do research on academic courses and college requirements needed to work in various health professions.

2. Have students interview people in various health professions. Have the class develop a list of standard questions to ask each person and then write papers about each person.

3. Have the students write papers on why they would or wouldn't want to work in the health field.

MATH AND SCIENCE --

"THE FOUR CHAMBERS OF THE HEART"

CULTURAL OBJECTIVE

Students will acknowledge that the heart is the center of one's world and spirit.

MATH OBJECTIVES:

Students will:

construct simple line and bar graphs, tables, and charts

read and interpret a given set of information contained in a table, graph, or chart

draw conclusions and make predictions from line and bar graphs, charts, and tables.

SCIENCE OBJECTIVES:

Students will:

identify the body systems and the organs comprising them

describe the structures and functions of the circulatory system.

TEACHER'S BACKGROUND INFORMATION:

Nekumonta, a chief of the Mohawks, wandered through the dark forest where he was searching for medicine herbs to cure the plague. There had been many moons of sickness in his village and the Mohawk had nothing with which to fight the plague.

Nekumonta's heart was heavy, for Shanewia, the light of his wigwam, was stricken with the plague. Nekumonta decided that he would find the cure to the plague to save his wife. After three suns of searching, he finally fell exhausted. In his troubled dream, he heard singers who murmured that they were the healing waters of the Great Spirit and if he could take the waters from their prison, then his wife would live.

Nekumonta dug deep in the earth and finally released the Healing Waters, allowing them to run merrily down the face of Mother Earth. He fashioned a jar to contain the Healing Waters. At the dawning of the fourth sun, he returned home where his Shanewia was cured back to health by drinking from the jar of Healing Waters.

Adapted from "The Healing Waters," in Legends of the Iroquois by William W. Canfield. Port Washington, New York, 1972 (re-issued).

STUDENT LEARNING ACTIVITIES:

1. After presenting the story about the healing waters, discuss the four chambers of the heart, including the following:

Vocabulary

heart
atrium
artery
ventricle
vein
valve
aorta
capillaries
pulmonary artery
pulmonary vein

Introduce the lesson about the heart with any maze puzzle. You can choose a maze of your choice. Ask the students how they are enjoying it and if it is difficult to do. Then hand out the maze of the heart. Discuss how the path of the blood flows through the heart using the heart ditto.

Introduce the vocabulary words. Have the students look them up in a dictionary and then write the definition in their own words. Discuss the words and where they are located on the heart chart.

2. Show the class an instructional film on the heart and tell them the ways in which the chambers of the heart are like a maze. Discuss each part and what it does. Ask the class to label the correct name for each part.

3. Teach the class how to find their pulse rates.

   a. Working in groups of 3-4 students, have the students make a chart including height, weight, and age.

   b. Have the students explain what a pulse is and why they think it changes or stays the same.

   c. Demonstrate the proper procedures for taking your own pulse. Have the students find their own pulse and take their own.

   d. Then, using musical tapes of Native American flute or drum music, have the students sit with their eyes closed. They are to be quiet. This will help them to concentrate on the music. Play one complete song. Have the students take their pulse and record it on the chart.

   e. Afterwards, discuss the feelings they had while they were listening to that piece of music.

   f. Do the same thing for different kinds of music, both slow and fast-paced.

   g. At a specific time, have an unexpected guest come to the class with a surprise announcement. Take everyone's pulse after it. After taking the pulse, let the students know that it was part of the experiment.

   h. When the activity is over, take all the data and graph it. Discuss the findings.

   i. You may wish to record pulses first thing in the morning, after meals. after recess or after exercising to see changes.

4. Determining blood pressure.

   a. Contact your local Indian Health Service area office and invite a nurse to speak to the class about blood pressure. Have the nurse take everyone's blood pressure.

   b. Have students make a chart so that they can graph the blood pressures taken by the nurse.

c. Have the nurse take their blood pressure 4 times during the day. Suggestions: early A.M., before lunch, after lunch, before P.E., after P.E., before the end of the day. Use a different color marker for each reading to be graphed

d. Discuss the results of the experiment on the following day. Why does age make a difference? Why does the time of day make a difference? Why does physical activity make a difference?

5. Tell the students the legend of the "Lake of the Bleeding Heart" and encourage them to re-enact the story as a play.

"THE LAKE OF THE BLEEDING HEART"

This is a story about how the lake got its name and why not many people go there. Long ago, a spirit chief lived with his daughter near this lake. His wife had died so he had to raise his daughter alone. She was very beautiful and she made very good cooking baskets.

Many times, she had seen people catching fish on the other side of the lake. She asked her father why none of them would come to their side of the lake. Her father told her that she was the daughter of a big spirit chief. Strangers would not come to visit because they were not spirit chiefs.

Another spirit chief – who was a very young man known as the "grizzly bear man" – went to a sweat lodge to hear some others talk. One man said that he had gone fishing by this lake and had seen the daughter of the big spirit chief. He watched her as she went fishing in the lake and then she noticed him. She quickly ran out of the water and onto the bank. There, he saw her turn into a big rock shaped like a stone. He was so afraid that he ran away and said he would never go back to the lake again.

The young spirit chief claimed that he was not scared by this story, and he would go to the place to see the spirit girl. So he went to this place. he was wearing lots of beads, an otter skin arrow bag, and he had a white chief bone in his nose. When he arrived there, the old chief saw him and told him to leave or else he would be turned into a rock, have his heart cut out, and thrown into the lake.

But the young man spoke to his elder chief and told him that he wanted to stay with him and would hunt, trap, and fish for him. The old chief replied that he would give his young daughter as a bride to the visitor. Although he spoke kindly, in the back of his mind, the old chief planned to kill the stranger.

However, because the young man was also a spirit chief, he knew about this plot. When he went to sleep that night, the young man's spirit voice went out to speak to the beautiful object of his desire. His spirit voice told her to go down to the lake where he would marry her.

The young girl walked down to the lake, but her suitor ran very fast, so fast that he did not see the old chief following behind him with bows and arrows. The young spirit chief looked upon the waters of the lake and saw that it was red, like blood. The spirit girl yelled to him to turn around, but it was too late; the father attacked her suitor.

Because the maiden yelled to her father, demanding that he stop the attack, he turned her into a big heart-shaped rock. (She is still on the shore near the lake today.)

The fight continued throughout the night and all of the next day. As he had warned, the old chief finally killed the young man, tore out his heart, took it, and poured the blood onto the rock that had been his daughter, saying, "Stand here always and watch. Every spring at this time, you will see the blood come back." He then threw the heart far out into the lake.

Large waves came up, he heard loud thunder, and saw lightning. He heard the young spirit chief yell far, far away, sounding very sad. Again, he heard the young spirit chief yell, proclaiming that he was going home to die.

The old chief left that sad spot and went to the sweat house where he lay down and fell asleep. While he was dreaming, he rolled over on the hot stones, which burned off his magic powers, and so he died.

Adapted from Marcelle Masson, A Bag of Bones – Legends of the Winto Indians of Northern California. Naturegraph Company, 1966, pp. 128-130.

EVALUATION ACTIVITIES

Each activity has its own built-in evaluation, such as analyzing the causes of change in blood pressure and pulse rate, and recognizing the parts of the heart.

RESOURCES:

Angier, Bradford. Field Guide to Medical Wild Plants. Harrisburg, Pennsylvania: Stackpole Books.

American Indian Science and Engineering Society. Science Activities for Children: A Collection of Lesson Plans. June, 1987.

Canfield, William W. "The Healing Waters," in Legends of the Iroquois. Port Washington, New York: 1972 (re-issued).
Adapted from Marcelle Masson, A Bag of Bones – Legends of the Winto Indians of Northern California. Naturegraph Company, 1966, pp. 128-130.

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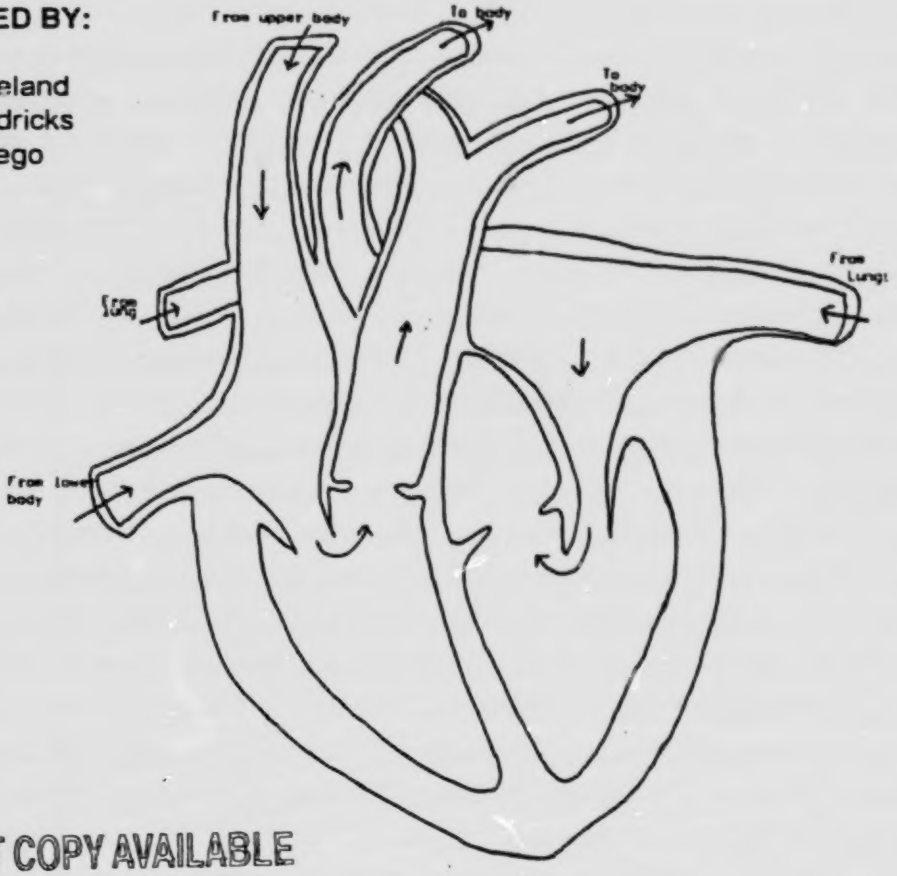


Sam Begay: Medicine Man

by Darlene Todechine

Spring finally arrived for Big Beard and his wife Lady Bitterwater. They were extremely happy this spring due to the arrival of their first born, a baby boy. The baby was born in early spring when flower buds were forming on plants. Big Beard was especially proud to have a son, who would help provide for the family when he was old enough.

The baby was welcomed into the family by a ritual that had been passed down from generation to generation. The baby was given a sacred Indian name by his maternal great-grandmother. He was named Conqueror of All. The name itself was an indicator of how one would lead his life.

As Conqueror of All got older he began to question the elders' comments, especially the ones dealing with names. One day his uncle Gray Horse came to visit and he asked his uncle why people are never to repeat their sacred names. His uncle told him that if one repeats his name, his ears would shrivel up and fall off. On the serious side, his uncle told him that sacred names are holy. Sacred Indian names are used in prayers to identify the individual to the gods of nature. They are used when an individual goes into combat so the gods protect the individual from harm and they are used to identify the patient who seeks a cure for his illness. Gray Horse went on to tell him that some names were earned by the individual, like the man who went hunting all the time for rabbits, he was called

Rabbit Scratcher. Conqueror of All was satisfied with his uncle's explanation and never questioned the elders again.

Big Beard was a medicine man who sang songs to heal his patients' spiritual being. Conqueror of All was a good helper but lacked the ability to sing. The ability to sing long hours is a requirement to become a singer so Conqueror of All was disappointed.

But his father Big Beard showed him another route to follow and that was to become a medicine man who uses medicinal plants to heal patients. Conqueror of All was enthusiastic and did his best for many years. His training took years because he had to learn about the interrelationships of plants and the solar system. "My training to become a medicine man would have taken less years if I knew how to read and write. I would have written everything down on paper and I could have done some reading on plants, but I had to learn everything by memorization. Now that I am old, sometimes I have to think about the right medicine that I would give a patient."

"During my training, I learned the names of plants and how to combine plants for a certain cure. I became aware that some plants were male and some were female and could only be gathered at a certain time of the season."

Today many Navajo children study plants (botany) in school. The classification system that botanists use to identify plants is different than the classification system that Conqueror of All learned. Botanists use a taxonomic classification system based on form and function and a Latin binomial (two-name) naming system designed many years ago by the Swedish naturalist Linnaeus.

Conqueror of All learned that the solar system played a major role in gathering plants. That is because the time of the year determines where specific chemicals which have a medicinal effect are concentrated in different parts of the plant. The concentrations of the different medicinal substances also vary with the time of year.

Plants are collected only when the moon is in certain phases. Conqueror of All learned early about the phases of the moon. Throughout each month of the year the moon appears with several different faces. The faces always follow one another in a specific sequence: a full moon is followed by a nearly full moon, a half moon, a crescent moon, no moon, a crescent moon, a half moon, a nearly full moon and back to a full moon again. Today's Navajo children study the phases of the moon in school. They know that the different phases of the moon are caused by the relationships of the positions of the moon (as it rotates around the earth in about a month), the earth (as it rotates around the sun in 365 days) and the sun.

No plant was sought out for pure enjoyment. Before plants could be collected, an offering was made to the sun before dawn and the patient's sacred Indian name was used in the prayer.

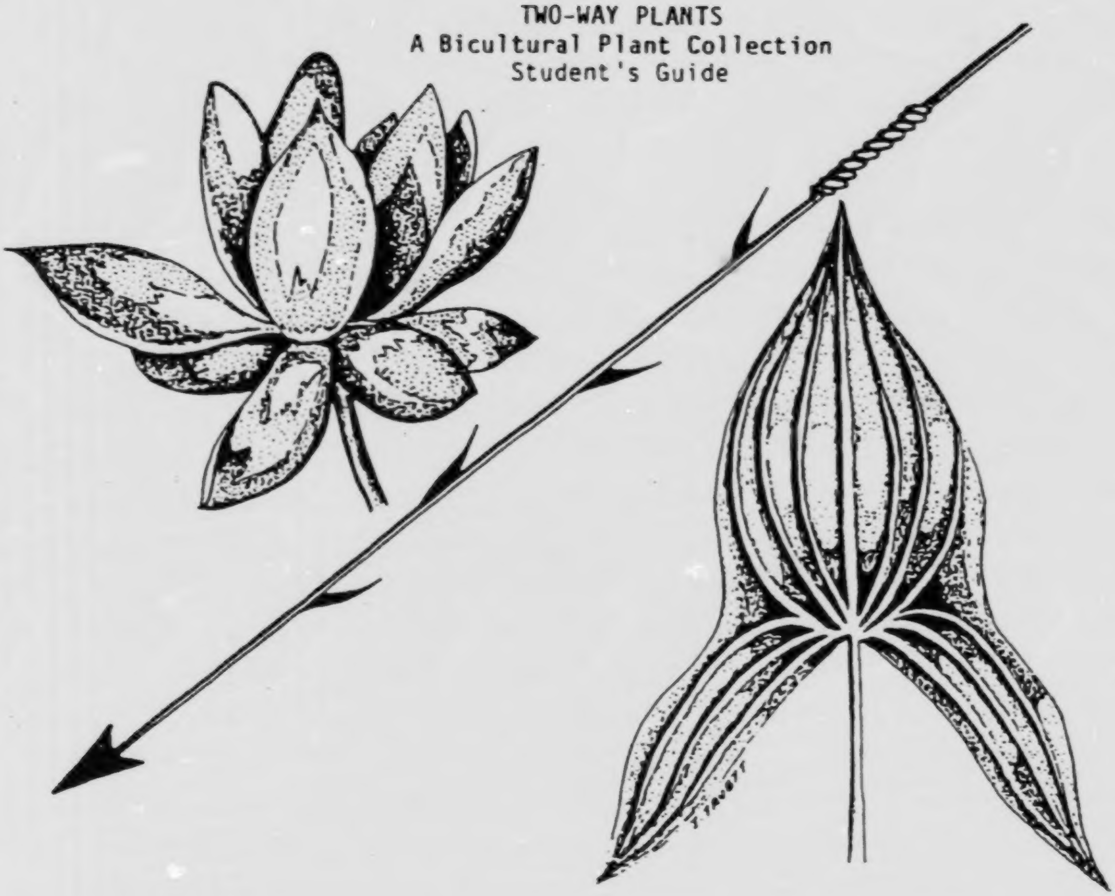
"Nowadays, I get patients who do not have sacred Indian names, so they give me an American name and sometimes it's hard to remember their names because I can't really relate an American name to anything in nature." Patients come from all over the Navajo reservation to seek a cure and often are referred to him by other medicine men. "I ask my patients questions related to their illness and I select medicinal plants based on the information they provide. Sometimes, patients come back to tell me that they have been cured, and I feel happy for them." Mr. Begay went on to say, "I learn something new every day, even at my age, so I feel that one is never too old to learn. Just put your mind to it."

Conqueror of All, Mr. Sam Begay, belongs to the Bitterwater and Bigwater clans. He is living today in a small community called Tselina in northeastern Arizona. He celebrated his ninety-sixth birthday this spring (1988). Conqueror of All can still be seen walking up to the mesas at dawn to seek out the gods for a spiritual cure for yet another patient.

ACTIVITIES

1. Have the students identify what science Sam Begay had to know to be a medicine person.
2. Have the students ask their parents about home remedies they use.
3. Have the students invite a local Medicine Person to visit and speak to the class.

TWO-WAY PLANTS
A Bicultural Plant Collection
Student's Guide



Foci of Inquiry: Are you familiar with the plants in your environment? Do you know their tribal names? Their tribal use and preparation? Their taxonomic names? If they are edible or poisonous? Where to find them? How to classify them? Etc.?

The use and knowledge of plants by people of American Indian tribes have been very important to the world. American Indian people's botantical expertise has greatly contributed to the fields of medicine, agriculture, chemistry and numerous other areas. Illnesses, such as malaria, which affect people around the world are cured by chemicals derived from plants which American Indian people discovered to be medicines.

It is very important to preserve the valuable plant knowledge your tribe may hold. It may help you in your own survival; you may find it important for your tribe to pass on to develop its technical knowledge; and it is important for the world, for there are certainly tribal discoveries by which the entire world may benefit.

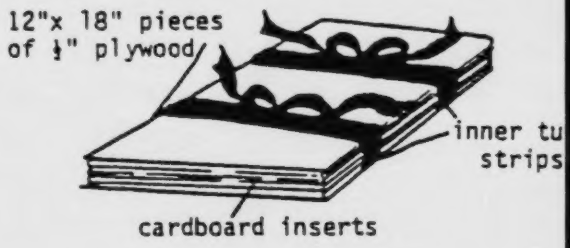
So, you will have a special opportunity in this activity to develop something important. You will be creating a plant collection, but it will not be an ordinary plant collection. Your collection will be one that includes not only scientific names but also the tribal names of the plants, the tribal uses of the plants, and how they are traditionally prepared. (This will all be done only for plants considered acceptable to the tribe).

Why Is This Important? You may find this activity important:

- For your survival: to understand which plants are useful or dangerous to you.
- For preservation of your tribal knowledge: to learn more from your relatives.
- For familiarity with your environment: so that you know what is out there, how it might change, and how you might make wiser decisions concerning your land.
- For future careers: you may wish to choose a profession which deals with plants.

Procedure:

Materials:

PROFESSIONAL	PURPOSE	IMPROVISED
tags with string	to number individual plants when collected	cut index cards into pieces ½" x ½"; punch hole and attach small pieces of string
vasculum	to keep the plants in which have been collected while still in the field	large plastic trash bag
blotting driers	to dessicate plants while being pressed	newspapers
plant press	to preserve and flatten plants	plant press created from plywood, innertube strips and corrugated cardboard inserts  12"x 18" pieces of ½" plywood inner tu strips cardboard inserts
mounting paper	for displaying pressed plants with information	mimeograph paper
herbarium tape	to attach plants to paper	tape or glue
mylar envelopes	to store finished plants	legal size file folders tied with strin

GENERAL

plant books	plant identification
water containers	for plants to be left in overnight before pressing
information labels (sample provided)	for providing plant information, on finished, displayed pla
clipboards	for writing outside
scissors or knives	for cutting plants
field forms	for recording field notes (sample provided)

1 Listen well and ask questions during the introduction given to you by the teacher of this project/activity.

Whom do you think you will talk with at home concerning your plants?

2 Prepare your tags.

3 The teacher will demonstrate the procedure for collecting plants. It is described in Steps 5 through 9 for your information. When you are out in the field, if you wish to add something to this procedure (for instance, in a traditional way), you may want to let the teacher know you will be doing this.

4 Get ready for the field outing: (a) be dressed properly; (b) obtain and organize your equipment properly; (c) find out where to meet; and (d) find out the limitations you have for what types of plants to collect and where you can go.

What types of plants are you NOT supposed to collect?

CAUTION: When out in the field be very careful where you put your hands and feet. There may be creatures there which you do not want to come into contact with.

In the field:

Name of Collector:______________________________
Date:______________________________________

HABITAT:______________________________

PLANT #	APPROXIMATE SIZE	DESCRIPTION

5 When you spot a plant for collection, on your field form you should assign it a number, estimate its size and generally describe it. Be sure to indicate the area or habitat where you are collecting at the top of your form.

Why do you think it is good to record a description and a number of your plant on your field list?

6 Because so many people will be entering an area to collect, it is recommended that the "official" botanical style of collecting the entire plant be changed. Collect just part of the plant so that the plant will not be killed. The part to collect should at least have a flower, leaves and parts of the stem. Use scissors or a sharp knife to cleanly cut the plant, rather than pulling or breaking it. Cut below a leaf nodule.

7 After writing your name and the plant's number on the tag, tag the plant by securely looping the string around an upper part of the plant. Place the plant in the vasculum or plastic bag. If using a plastic bag, try to keep it inflated with your breath, which may better preserve the plants by adding carbon dioxide and moisture.

8 Clean up the area so that it looks just as you found it -- or improve on it! Pick up any trash you might be able to throw away later. Make sure you have all your equipment.

9 Go on to find another plant and repeat the procedure. Stay organized!

10 The teacher or other students may point out to you any unique plants they come across -- so keep your ears and eyes open to your fellow collectors. You, too, may wish to share some of your "finds."

Back at school:

11 If you have to leave your plants overnight, you may place the cut ends of your plants in containers of water to help preserve them.

12 When you are about to press your plants, again try to stay organized. First, gather your plants and all needed materials around your working space.

13 Place the plant on the blotting paper or newspaper; allow as much paper to each plant as possible. If you are using newspaper, place a double sheet between each sheet which has a plant on it. Because you may be adding more and more plants to your press as the days go by, place one plant on one piece of blotting paper just for the first day(s) until you have more plants to add. Then move those that have been in the press together to share blotting papers, since they will already be somewhat dry.

14 You and the teacher can judge the best amount of time for pressing. If you live in a dry area, you can mount the plants even when they are not completely dry. Yet, they will be flat. In this way they

will finish drying on the mounting paper and they will retain more of their original colors. If you live in a humid area, check the plants once every three days and replace the blotting papers or newspaper, if necessary.

A. How does pressing preserve the plants?

To mount the plants:

15 Attach an information label to the lower left or right corner of the paper to be used. Write your name, and date collected on the lower part of the label. Write the number of the plant on the back of the mounting paper. In an attractive arrangement, glue or tape the pressed plant onto the paper. The plant may be trimmed if necessary.

To research information at home:

16 You may decide to talk to one person or several people who know something about plants. Please do not expect to gain information on every plant--just as many as possible. Use your imagination about who to talk to. The person may be a relative, friend of the family, senior citizen, or someone who your teacher recommends. Keep trying to find someone--don't give up!

Take home your collections and show each plant to a knowledgeable person and ask the name. Spell it in the tribal alphabet or try to just sound it out. Record it on the label. Ask the person, "How is this plant used?" Write what they tell you on the label. If there is a use, ask your home/tribal resource person, "How is the plant prepared and in which season should it be collected?" Add this information on the bottom section of the label.

17 Write a paragraph describing what you did at home to find out about the plants. For instance, who did you talk with? What did he or she generally say about the plants? Were you told about other plants you did not have? Did you go out with them to look for more plants?

To find the scientific names of your plants:

18 Bring your plants back to class, where you will find the teacher's "master" collection displayed. Match your plants with the teacher's, and you will then find the scientific name. Be sure they are exactly the same species of plants. Write the scientific name in the correct space on your label. If you have plants which cannot be found in the master collection, check with the teacher, who may ask you to key it out using reference books. The teacher may ask you to donate your plant to the master collection.

19 Finally, follow the instructions your teacher gives you about the finishing touches on your collection and about turning the collection in.

Self Check: Do you know the following words: classification, binomial nomenclature, taxonomy, malaria, botanical, nodule, preserve, moisture, humid, habitat

Your teacher, and perhaps a member of the community, may grade your collection. Along with the paragraph in Step 17, you may also be asked to write a paragraph about how you liked doing the collection.

You will probably be tested on what you learned by doing the collection. Your teacher will let you know what to expect on the test.

Going Further:

- -- Contribute plants to the class for a master collection.
- -- Create one or several displays to be shown in public places around the community.
- -- Enter nice-looking plants in a school art show.
- -- Sell individually pressed plants for fund raising.
- -- Make drawings of the plants and include all the information for producing a small book about local plants.
- -- Compare your tribe's use of plants with other tribes.
- -- Research the contributions American Indian people have made to the world through their knowledge of plants.
- -- Keep collecting plants to increase your collection.
- -- Take your own "field trips" with elders to learn more about plants.

Additional Resources:

- -- Different experts of the tribal community
- -- Scientific plant "experts" in the area, such as people in the field of natural resources or park rangers
- -- Botanical associations and clubs
- -- Special publications or articles on your tribe's use of plants

Related Careers: You may wish to consider the following careers because some of the techniques you've used in this investigation are used by some of the following people:

- -- Tribal Plant Specialist
- -- Botanist
- -- Biologist
- -- Ecologist
- -- Natural Resource Person

TWO-WAY PLANTS
A Bicultural Plant Collection
Teacher's Guide

Overview: This activity spans the realms of both conventional and American Indian botany. Basically, each student gathers a collection of plants and identifies them in two ways. At home, from relatives or family friends, they learn the Indian name, uses, and preparation. Then, in class they identify them taxonomically and by their common English names. All possible information is recorded for each plant by each student. The result for one class of, say, 24 students is a huge collection of local plants having very thorough local and taxonomic information.

Objectives: The students will:

-- Biculturally apply the fundamentals of classification.
-- Improve communication between themselves and community and family members via plant research and discussions.
-- Preserve traditional scientific knowledge.
-- Gain a base for future activities and experiments using local plants.

Techniques and Information:

IMPORTANT NOTE: Before you carry out this lesson plan, ensure that it is modified for and approved by the community of which your students are a part. You may ensure this in several ways which are discussed in the introductory sections of the teachers' guide.

A unit or introduction to classification should preceed this activity so that the students will be familiar with taxonomy and binomial nomenclature. If there is a tribal system of classification, it may be researched by students and included as another type of classification.

The students may experience some difficulties in finding someone at home to help them with their plant identification. Encourage them to try alternatives but not to give up. There are numerous tribal resource routes the student and you may take. See the introductory section regarding tribal resource people in the beginning of this teacher's manual. As this may be one of the first bicultural activities you use, you may wish to ask a knowledgeable person from the community to come to class to talk about various uses of plants. This will show the students that it IS POSSIBLE to speak with an elder about the plants at home. What is also very effective is to ask an elder to accompany students when going out to collect plants.

This activity is adjustable in how extensive you design it. If the class attempts to gather plants from all areas of the reservation or locale, then this activity can be combined with studies which require visiting all local habitats. For example, the class may also be concerned with soil studies and at the various locations collect soil samples. Or they may be doing ecological habitat studies such as in the water or land research activities. This saves numerous trips to distant locations. Also, peruse the other lesson plans which require the use of plants so that you may coordinate their gathering with this activity.

The Master Collection: It would be very valuable if you. the teacher could previously visit the collecting sites, photograph a slide of all the plants to be collected (with a relative measure in the picture), collect the plant, and create a master collection. This (laminated?) collection would not only have a slide of the plant attached to the paper holding the pressed plant but also have the taxonomic information keyed out so that students can identify their plants using the displayed master collection. Keying all the plants by having the students use references may not be suitable to large classes, since keying the plants is very time consuming and might take the botanical sleuth to some esoteric books. By using a master collection, students may still do some keying if they have plants not found in the master collection, but they may concentrate their efforts on gathering information at home. Also, they may borrow the slides from the master collection when their relatives do not recognize the plant in its pressed form due to discoloration from pressing.

When it comes time for the students to scientifically identify their plants, simply tape your master collection up along the walls within range for the students to be able to read the names. (Eventually you may wish to add information the students bring from home to the back of your plants.)

You should supply the students with label forms for their specimens. Sample labels are included at the end of this Teacher's Guide.

For resources, the teacher may wish to use:

-- Plant taxonomy guides -- a wide variety usually helps
-- References dealing with plant use by American Indian tribes for general ideas and comparisons
-- Local plant experts, not only in the tribe but also in the environmental sciences professions
-- Original research in possible classification systems used by the tribe.
-- Botanical references appropriate to the Southwest include:

Dodge, Natt N. (1963) 100 Desert Wildflowers of Southwest Uplands in Natural Colors, Southwestern Monuments Association. Globe, AZ.
Dodge, Natt N. (1967) 100 Roadside Wildflowers of Southwest Uplands in Natural Colors, Southwestern Monuments Association, Globe, AZ.
Fox, Eugene J. and Sublette, Mary (1978) Roadside Flowers of New Mexico, Llano Estacado Center for Advanced Professional Studies and Research, Eastern New Mexico University, Portales.
Gould, Frank W. (1977) Grasses of Southwestern United States. University of Arizona Press, Tucson.
Martin, Alexander C. (1972) Weeds (A Golden Guide), Golden Press, New York.
Patraw. Pauline. (1977) Flowers of the Southwest Mesas, Southwest Parks and Monuments Association, Globe, AZ
Spellenberg, Richard. (1979) The Audobon Society Field Guide to North American Wildflowers (Western Region), Knopf New York.

During your introduction (A) as an assignment have the students identify who at home or in the community they will talk to about plants (B) assure students that sensitivity to tribal ethics will be followed and plants with religious importance will not be collected (C) notify students of any legal rules and regulations.

Plant collecting can be done with professional grade equipment. if available or with improvised materials Improvised plant presses such as stacks of books or rocks on boards work well. (Pressing plants under a car has worked successfully and only takes overnight!) Both lines of equipment are suggested in the students' materials sections. During the explanation of the activity, the professional terms for the equipment will be used (optimistically).

For clear identification, it is easiest to limit students to collecting plants in bloom trees, shrubs, cacti or anything else unique and relatively easily identified. (Grasses, though important, are somewhat difficult, as are nonblooming plants) If the students return to class with plants which need to be kept overnight, for organization use one container of water per student -- the bottom halves of plastic jugs work well You may want the students to press plants as soon as they have brought them in: in this case, have the presses ready to go.

Before the students attempt to press their plants, you may wish to demonstrate how to press plants using the procedure they have been given or adding your modifications.

Evaluation: The Objectives may be used as guidelines when you design your own evaluation to this activity (Don't forget to evaluate non-academic skills such as technique, a "willingness" to try or teamwork.) You may wish to evaluate the students on the following or on other criteria

-- Their field techniques and plant preservation techniques.
-- The description by students of the research process they went through at home.
-- The plant collections (try to bring in experts from the community to judge or grade them)
-- The subjective paragraph written by students at the end of the unit describing their reactions to the activities
-- A quiz or unit test on the plant collections, including biological test on identification, tribal identification of plants, familiarity with tribal uses of plants, knowledge of techniques for traditional preparation.

Extension:

-- Research tribal classification systems.
-- Identify subspecies or other variations of common local plants.
-- Set up displays in the community.
-- Produce publications.
-- Use pressed plants for fund raising.
-- Compare the plant usage of the local tribe with that of other tribes
-- Trace medical pharmacopaeia to plants used by American Indians.
-- Look into the world-wide history of New World (indigenous) plant "discoveries."

Note: Label the top section with the name of the tribal language. Below that add the word for "name": in the tribal language.

SAMPLE LABELS (cut into four on dotted lines)

____

: ____________________

Local Uses: ____________________

ENGLISH

Name: ____________________

Scientific Name: ____________________

Characteristics: ____________________

Collected by: ____________________

Date Collected: ____________________

____

: ____________________

Local Uses: ____________________

ENGLISH

Name: ____________________

Scientific Name: ____________________

Characteristics: ____________________

Collected by: ____________________

Date Collected: ____________________

____

____

Local Uses: ____________________

ENGLISH

Name: ____________________

Scientific Name: ____________________

Characteristics: ____________________

Collected by: ____________________

Date Collected: ____________________

____

____

Local Uses: ____________________

ENGLISH

Name: ____________________

Scientific Name: ____________________

Characteristics: ____________________

Collected by ____________________

Date Collected: ____________________

Anthony Flores

by Jeanne T. Bagnall

Recently the Papago People have changed their name to Tohono O'odham which means Desert People. The Tohono O'odham (To-ho-no-Ah-thumb) Reservation is located along the Mexican border in Central Arizona. The Reservation covers 3 million acres of land, and is second in size to the Navajo Reservation. About 15,000 people live in the 50 villages on the Reservation. The Reservation is divided into 11 political districts each with its own governing body, an elected council. Each elected council selects two representatives to the Tribal Council. The Tohono O'odham Agency Headquarters is located in Sells, Arizona. Sells is the Tribal Capital, and has a population of about 3,000 people. Most of the jobs are in Sells. The major employers, accounting for over 95 percent of the jobs are the Tohono O'odham Tribe, the Tohono O'odham Agency, and the various Indian Health Service programs.

One program under the Indian Health Services is the Alcoholism Counseling section. Anthony Flores is an Alcoholism Youth counselor for his tribe. An Alcoholism Counselor works with and treats people who are abusers of alcohol. Before becoming a counselor, he was an Educational Aide at San Simon School (41 miles west of Sells) in kindergarten, first, second, and fifth grades. He taught his students to be proud of who they are and where they came from. Anthony felt that this concept would be the most important one his students would ever need to know. This is also a self concept he has grown up with and one he takes great pride in. Being the traditional person that he is, he's had to struggle often with modern society and the influences they have had on him and his people. This is one of the reasons he became fluent in both his Native tongue and the English language. He realized that he would need both languages in order to survive in today's world. Anthony has tried to live in harmony with all creation and all people. This is the reason he feels his Creator brought him to the surface of the earth, to be respectful of nature and others, as well as oneself. He has learned to find uses for most everything he encounters in nature. He is not wasteful of nature. He does not rely on "modern technology" to survive, although he does use it at times.

Anthony lives in a village 60 miles west of Sells. He travels to and from Sells every day to go to work. Anthony has a large family whose members live in different villages throughout the Reservation. He is a strong leader in his family. He has helped both himself and his family to become almost alcohol free. He plans and organizes family outings to keep in close contact with all his family members. This also helps to secure and strengthen their family bond.

Since Anthony chose to become an Alcoholism Counselor for his people, he accepts a big challenge every day of his life. His primary reason for becoming an Alcoholism Counselor was his concern for children that come from alcoholic families. He saw tremendous abuse of alcohol taking place among his people, and a great deal of precious life being wasted. Alcohol abuse and its effects were present in the students that he taught at school. Also, since he himself came from an alcohol-dependent family he was even more aware of the crisis. Coming from an alcohol-dependent family also helps him to understand and relate to the situations that his clients are in.

Ethyl alcohol, or drinking alcohol, belongs to a class of chemical compounds that contain the elements Carbon (C), Hydrogen (H) and Oxygen (O). All alcohols contain a hydroxyl group-a combination of oxygen and hydrogen written chemically as -OH. Ethyl alcohol is made chiefly from grains including corn, rye and barley or fruits like grapes that have been allowed to ferment. Fermentation means that yeast convert the sugar in these foods to alcohol and carbon dioxide (the bubbly gas that rises to the surface when alcoholic drinks are opened or poured. This is the same gas in non-alcoholic carbonated drinks.) All alcoholic drinks-wine, beer, gin, whiskey, etc. contain the same kind of alcohol-ethyl alcohol: some just contain more alcohol than others.

Alcohol has little food value and in large amounts it can interfere with normal behavior. Alcohol is a drug called a depressant because it slows the activities of the central nervous system. It is illegal to drive if your blood alcohol concentration is too high. Blood alcohol concentration is determined by the amount of alcohol ingested and the blood volume of the user. Alcohol is absorbed directly into the bloodstream. It does need to be digested before it is absorbed.

Some adults like to drink alcoholic beverages because they like the taste, it improves their appetite or it helps them to relax. Some people, however, have an overwhelming desire to drink alcoholic beverages. These people are called alcoholics and the disease that they have is called alcoholism. Alcohol is one of the leading causes of death each year and problems caused by alcoholism are especially severe on many Indian reservations. Some scientists believe that alcoholism has a genetic origin. That is, the compulsion to drink alcohol is a characteristic that is passed from parents to children. Some scientists believe that psychological factors such as stress may cause alcoholism. Whatever the cause, the effects are the same. People who ingest too much alcohol experience mental confusion, cannot walk steadily or talk clearly. Mothers who drink alcohol when they are pregnant risk having babies with fetal alcohol syndrome. These babies are abnormally small at birth, may have malformed organs and may be mentally retarded. The treatment for alcoholism involves caring for both the alcoholic's physical and emotional needs.

Anthony counsels both junior high and high school age children. He takes a personal interest in each client's well being and welfare. He always puts the clients first and does what's best for them. In counseling his clients, he uses a variety of treatment methods. He uses one-to-one counseling in which he and the client work together to seek treatment. He also uses group counseling. In group counseling, he tries to develop student leaders among the group of clients. The student leaders help themselves, but also learn to help their fellow students as well. He uses several outdoor activities with his clients to show them that there are alternatives to alcohol use. He conducts both clinics and educational sessions within each school system. These sessions inform the students of the harm alcohol can cause and ways to prevent it. Anthony's primary concern in dealing with his clients is to help them find and accept their own identity. He also helps them to develop a good self concept since having a poor self concept is one reason many people turn to alcohol in the first place. Anthony also works under the Court Diversion Program for the Tribal Court System. The Court assigns him juvenile offenders that are in need of counseling. Anthony feels there is a tremendous amount of pressure involved in working with both juvenile offenders and young alcoholics.

One traditional treatment that Anthony uses for himself and his family is the sweat lodge. The sweat lodge has a frame that is domed shape with one opening. It is constructed from willow tree branches, strips of cloth, and old tarps. The sweat lodge is considered a very sacred place and is treated with both honor and great respect. A large pit is dug outside the sweat lodge and a fire is built inside the pit. Huge rocks are then placed within the pit and remain there until they are hot enough to begin the ceremony. When the rocks are hot enough, they are carried on a pitch fork to the pit that's been dug inside the sweat lodge. Water is then sprinkled onto the rocks which creates steam. This cleanses a person and takes away any impurities (such as alcohol in the body). There are a lot of shared feelings and often, many emotions are displayed during the sweat lodge ceremony.

For Anthony and his family another method of treatment is found in the Native American Church. In the Native American Church, which takes place in a traditional tee-pee, several types of traditional instruments are used. A kettle drum which consists of a tanned hide, a few small pebbles, a small amount of water, a rope, and a kettle pot emits a beautiful sound when played upon. A gourd with small pebbles inside it also creates a soothing rhythmic sound, especially when it is played along with the drum. Singing is also included along with the playing of the music. Together this creates a most powerful display inside the tee-pee church, that can be heard from miles away. The Native American Church is also a very sacred and highly honored place. Although it is not the answer to all, it is the one that Anthony and his family have found to be of great strength.

At the present time, Anthony is taking classes to become a State Certified Counselor. Since he is a member of his tribe they are helping him financially to complete his schooling. Anthony feels that all students should remain in school and do the best they can. They will need the schooling in order to become a better person in the working world. They also will then be in a better position to help their own people with their daily struggles. Anthony Flores knows what he's talking about!

ACTIVITIES

1. Have the students write personal papers telling how it makes them feel when someone they know gets drunk or high.
2. Have the students write papers explaining why alcoholism is referred to as a family disease.
3. Have the students write papers explaining how each person in a family is important to the makeup of the whole family, how family members need each other's help and support, and how the actions of family members affect other members.
4. Have the students write papers telling what makes them feel good and bad and how they manage their feelings.

2+2=4

MATH QUIZ

1. Is alcoholism a problem on your reservation? What about on other reservations? Make a bar graph showing the percentage of alcoholism in at least five tribes.

Using the sheet "How to Calculate Blood Alcohol Concentration Levels" answer the following questions:

2. Whose blood alcohol concentration level is higher

   a man who weighs 200 lbs. and drinks 3 beers or

   a woman who weighs 120 lbs. and drinks 2 beers?

3. Tom had 5 beers tonight. He weighs 150 lbs. What is his blood alcohol concentration level?

How To Calculate Blood Alcohol Concentration Levels (B.A.C.)

Information Needed and Sample Problem

B.A.C. is defined as the weight of alcohol (in grams,g) in 100 milliliters (mL) of blood

FACTS:

In males, 60% of the total body weight is water weight (blood).
In females, 55% of the total body weight is water weight (blood).

1 can of beer (12 ounces) usually contains 3.2% alcohol by volume. That can be expressed as 3.2 mL of alcohol/100 mL of water.

1 ounce contains 30 mL. 1 Kilogram contains 2.2 pounds. There are 1000 mL in a Liter (L). There are 1000 g in a Kilogram.

The density (g/mL) of water is 1. The density of alcohol is .8.

PROBLEM AND SOLUTION:

Calculate the B.A.C. level of a 175 pound male who just drank three beers.

a.) convert body weight from lbs. to kilograms

175 lbs x 1Kg/2.2 lbs = 79.5 Kg

b.) calculate body water (blood) volume

79.5 Kg x .6 x 1mL/1g x 1000g/1 Kg x 1L/1000 mL = 47,700 mL

c.) calculate the weight of alcohol in 3 cans of beer

3.2 mL alcohol/100 mL water x 12 ounces/1 beer x 3 beers x

30 mL/1 ounce x .8 g alcohol/1 mL alcohol = 27.6 g alcohol

d.) calculate B.A.C. (g alcohol/100 mL blood)

27.6 g alcohol/47,700 mL blood = x g alcohol/100 mL blood

(cross multiplying to solve the proportion we get:

$47{,}700x = 27600$

dividing both sides of the equation by 47,700 we get:

$x = .058$ or rounding to hundreths, $x = .06$

In Kansas, you can be cited for driving under the influence of alcohol if your B.A.C. is .1 or higher.

OBSERVING THE EFFECTS
OF ALCOHOL USE
Student's Guide

Focus of Inquiry: In real-life situations, how does alcohol affect humans, physically and behaviorally?

In this activity, you will be scientifically observing and analyzing the way alcohol affects people, both physiologically (in their bodies) and behaviorally (in the way they act). You may also be making economic estimates as to how much money is spent on alcohol in a given day. You will be encouraged to develop your own ideas about the way alcohol affects people. Most of this will take place in a realistic situation, because you cannot necessarily learn everything about alcohol from a book.

You will visit a local drinking spot or the local "drunk tank" and scientifically observe what is happening there. You will take field notes and complete the chart and eventually the worksheet which is provided.

When you go into these realistic situations, please try to remain objective when you observe people. If you see someone you know, please think of him or her as a neutral human being. The person will be referred to in your notes by letters, such as Person A or Person B, etc. Most societies in the world have problems with drinking. It is a human problem. In fact, you will probably encounter people of different backgrounds during this activity.

Why Is This Important? This activity may be important to you:

- To see and learn about alcohol in a real situation.
- To try to scientifically observe a situation which you may find difficult to be objective in.
- To identify and observe the physiological and behavioral effects of alcohol.
- To estimate how much money is being spent and made on alcohol locally.
- To try to better understand the entire complex picture of alcohol use.
- If you go into medical fields or counseling, experiences such as this may benefit your professional work.

Procedure:

Materials: Clipboards, field form, binoculars (optional)

1 In class, this activity will be introduced to you by your teacher, who will discuss how to go about the activity, the importance of being scientifically objective, and treating the experience seriously.

2 On foot, or in a bus, you and the class will travel to a local drinking spot or "drunk tank." At the location, you should remain as distant and unobtrusive as possible, while still being able to observe the people there.

3 Observe how various people are acting. Use your binoculars if it is necessary and acceptable. Complete the field chart according to the instructions you find at the top.

4 If you are at a place where liquor is being sold, try to keep a "guesstimate" of how much money is spent on liquor over a half hour period. Record on your chart. Do the calculation, when you are back in class.

5 When you return to class, or, if you have time while you are still observing, review the behavioral and physiological characteristics of the individuals you observed. Then, using the chart provided on your worksheet, estimate the number of drinks and blood alcohol level of the individuals you observed.

Observing the Effects of Alcohol--FIELD CHART

INSTRUCTIONS: Under the heading, Observed Behavior, you will describe what you see people doing in as much detail as possible. You will be looking for people who you believe have been or are drinking. If there are not many people there, the teacher may describe a hypothetical situation for you.

Please put one action per box and assign letters to people, such as referring to someone as Person A or Person B, etc.

In the second and third columns, you will be interpreting the resulting physiological and behavioral effects alcohol has on these people. You may select a physiological and/or behavioral characteristic from the following lists which you believe explains the action or behavior which you have described. Write these in the corresponding sections to the observed behavior. OR, you may wish to develop and write in your own interpretation--that means, not using one from the lists, but writing in your own ideas of what is causing them to behave the way they are. If you observe something which you do not believe is explained by the characteristics on the lists, again develop your own explanation. Your teacher may give you several examples for your chart.

PHYSIOLOGICAL EFFECTS

-- Central nervous system depressant(especially in cerebral cortex and reticular activation systems)
-- Kidney function--diuretic
-- Vasodilator--feeling of warmth and extremities become red
-- Unconsciousness
-- Death
-- Lack of nutrition due to substitution of calories by alcohol
-- Cirrhosis of liver--jaundiced (yellow color) or swollen liver
-- Pellagra (lack of vitamin B leads to digestive problems and red spots

BEHAVIORAL EFFECTS

-- Increase in verbal and assertive behavior
-- Reduction of anxiety
-- Reduction of inhibition
-- Aggression/violence
-- Reaction time reduced

(Remember to refer to people as Person A, Person B, Person C, etc.)

OBSERVED BEHAVIOR	PHYSIOLOGICAL EXPLANATION	BEHAVIORAL CHARACTERISTICS

Observing the Effects of Alcohol -- SUMMARY WORKSHEET

On this worksheet, you will summarize your findings and estimate the amount of alcohol the person had consumed and approximate their alcohol blood levels using the chart provided below.

Person (letter)	Summary of behavioral and physiological symptoms	Estimated number of drinks	Blood Alcohol Level

Financial Calculations:

1. List here what you've seen purchased over the half hour period and estimate how much was spent on each purchase.

What was Purchased	Cost Estimate	What was Purchased	Cost Estimate

2. If that much was purchased consistently over a twelve-hour period, how much would be spent?

3. If twelve hours of sales are normal for each day of the week. How much would be spent over a week, month, and year?

______________________________(Week)

______________________________(Month)

______________________________(Year)

4. What would you suggest to be a better use for this money?

BLOOD ALCOHOL CONTENT	EFFECT	NUMBER OF DRINKS
.03 %	Person becomes relaxed lessening of inhibitions	1 🥃 or 1 🍾
.06 %	Decrease in fine motor skills decreased coordination	2 🥃 or 2 🍾
.09 %	Exaggerated behavior loss of good judgment	4 🥃 or 4 🍾
.12 %	Loss of coordination and balance	5 🥃 or 5 🍾
.15 %	Person is totally uncoordinated lack of alertness	6 🥃 or 6 🍾
.40 %	Unconsciousness occurs	17 🥃 or 17 🍾

1 ounce of 100-proof whiskey • 1 12-ounce beer

NOTE: The above estimate may vary with body weight and an individual's chemical make-up.

Self Check: Do you know the following words? counselor, anonymous, rehabilitation, physiological, behavior, cirrhosis, vasodilator, diuretic, objectively, cerebral cortex, depressant, central nervous system, reaction time, hypothetical.

In a paragraph or two, describe what you have learned by doing this activity.

Going Further:

- Continue to look for physiological/behavioral effects when you can observe people who have been drinking.
- Go to the local hospital to talk with doctors about their experience and ideas relating to alcohol.
- Visit a rehabilitation center.
- Research the most recent medical findings about alcohol use and abuse.

Additional Resources:

- Alcohol or substance abuse counselors
- Alcoholics Anonymous
- Speak to a former or current heavy drinker
- Medical people -- both traditional and conventional

Related Careers: You may wish to consider the following careers because the techniques you've used in this investigation are used by the following professionals:

- Psychologist
- Sociologist
- Substance abuse counselor, etc.
- Law enforcement
- Alcohol researcher

OBSERVING THE EFFECTS
OF ALCOHOL USE
Teacher's Guide

Overview: With field research, this lesson reinforces classroom education about the physiological and behavioral effects of drinking alcohol. Although this activity is unusual and perhaps even controversial, it is, nevertheless, an amazingly effective means of studying alcohol consumption.

The students visit a local drinking spot or local drunk tank and try to scientifically observe what is occurring. They take field notes and make interpretations. If they are observing at a place where liquor is sold, they also estimate the financial transactions taking place. The students do tend to take the activity seriously and are left with more objective and insightful impressions about drinking alcohol.

This lesson plan was inspired by a comment from a professional (American Indian) health educator who claimed that one of the strongest impressions she had of alcohol was when her junior high school teacher took the class to the "drunk tank" to simply observe people there. She attributed her moderate drinking habits to that experience. This activity is a modification of that profound educational experience. This activity incorporates scientific skills and concepts; it has options that may be carried out at a location that is not quite as intense as jail, is outdoors, and is probably easier to reach than a large, local jail.

IMPORTANT NOTE: Before you carry out this lesson plan, ensure that it is modified for and approved by the community of which your students are a part. You may ensure this in several ways which are discussed in the introductory sections of the teachers' guide.

Objectives: The students will:

- Observe the effects of drinking alcohol in a realistic situation.
- Apply the physiological and behavioral concepts learned in class to a realistic situation.
- Calculate an estimation of money spent over a day, week, month and year.
- Develop or discover some insights about alcohol through original analysis.
- Strive to remain objective in a situation which often warrants nonobjective reactions.

Techniques and Information: This activity may be incorporated well into a unit dealing with alcohol or substance abuse. If it is to be used as part of a Physiology course, you may also tie it in to units such as blood chemistry or the nervous system -- anything related to the affects of alcohol.

The class should already have a background or introduction to the sociological, physiological and behavioral effects of alcohol so that the information included on their charts is a review. For additional information about the physiological/behavioral effects of alcohol, you may refer to college texts or references specifically concerning the subject.

In the field, the important point to impress upon the students is to try to remain objective. They should be encouraged to form their own opinions based on their observations. Try to schedule the activity at a time when you think there will be many subjects to observe. If nothing is going on in the field, you may wish to ask students to develop some hypothetical situations to use for their studies. Or, you may develop some scenarios and describe some behaviors which you hypothesize. Finally, you may try a blend of combining both the behaviors which are really taking place and filling in with some hypothetical situations. In all of these cases, it may be easiest to create characters such as Person E or Person R for the students to use to record on their charts.

Evaluation: The Objectives may be used as guidelines when you design your own evaluation to this activity. (Don't forget to evaluate non-academic skills such as technique, and a "willingness" to try.)

You may choose to use the following or other criteria for evaluating the students on this activity:

-- The field and follow-up charts they complete.
-- Their subjective paragraph about "what they learned."
-- What their attitudes were to this somewhat different experience: did they remain objective?

Extension:

-- Research physiological effects on the cellular level--exactly what happens to nerve cells or other cells?
-- Cooperate with a Social Studies, Sociology or Psychology class and research the effects of alcohol from a more sociological point of view.
-- Research the latest findings in the effects of alcohol on the body and on behavior.
-- Visit a rehabilitation center.
-- Visit a local hospital and talk to doctors about the effects of alcohol.
-- Ask a substance-abuse counselor, medical person or tribal specialist to give a guest presentation regarding the effects of alcohol.

SCIENCE STANDARDS ADDRESSED IN HEALTH UNITS –

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks –
Understands how science improves its predictions and explanations of the world through the continuous testing, revising and occasional discarding of theories; this leads to better understanding of the world, but not to absolute truth
Understands that science can inform (but not resolve) moral decisions and other matters that cannot be proved or disproved, by identifying the likely consequences of particular actions

Standard – Understands that scientific inquiry works in particular ways
Benchmarks –
Understands that experiments are done for different reasons, including to explore new phenomena, check previous results, to test a theory, and to compare different theories
Understands that new/old ideas often encounter vigorous criticism in science, but are ultimately judged on how they fit with other theories and their capacity to explain and predict
Understands that science has different traditions about what is studied and how, but there are shared beliefs in the value of evidence, logic and good arguments, and that progress in science comes from intelligence, hard work, imagination and even chance

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that research involving human subjects may be conducted only with the informed consent of the subjects
Understands that science disciplines differ from one another in what they study, their techniques and goals, but share a common purpose and philosophy

Standard – Knows about the diversity and unity that characterize life
Benchmarks –
Knows that the degree of kinship between organisms or species can be estimated from the similarity of their DNA sequences

Standard – Understands the genetic basis for the transfer of biological characterisitics from one generation to the next
Benchmarks –
Knows that genes are segments of DNA molecules, and that inserting, deleting, or substituting portions of the DNA can alter genes; changes in DNA (mutations) can also occur when a cell is exposed to certain kinds of radiation or chemical substances
Knows that fragments of DNA can be analyzed to identify the individual from which the sample of DNA came, diagnose human genetic abnormalities, and to study populations

Standard – Knows that general structure and functions of cells in organisms
Benchmarks –
Knows that many molecular aspects of life processes of multicellular organisms occur in cells: cells are the sites of chemical syntheses and energy conversions essential to life
Knows that cells are highly organized collections of chemical substances; the fundamental chemical substances of life are long chains of carbon atoms with differing functional groups, including carbohydrates, lipids, proteins and nucleic acids
Knows the complex interactions among the different kinds of molecules in the cell cause distinct activities, such as growth and division; each metabolic event consists of many chemical reactions, each catalyzed by a specific enzyme
Knows that exposure of cells to certain chemicals and radiation increases mutations and thus increases chances of cancer, a gene mutation that results in uncontrolled cell division
Knows that when mutations occur in reproductive cells, the changes in genetic information can be passed on to successive generations

Standard – Understands the human body as a system of cells with specialized and coordinated functions
Benchmarks -
Knows that the lungs take in oxygen for the combustion of food and release the carbon dioxide produced; the urinary system disposes of other dissolved waste molecules; and the skin and lungs rid the body of heat energy (which most of the energy in food eventually turns into)
Knows that the immune system provides protection against microscopic agents/organisms that enter the body and against cancer cells that may arise from seemingly normal cells
Knows the nervous system exerts its influences by electrochemical signals along nerves and from one nerve to the next
Knows that the hormonal system exerts its influences by chemicals that circulate in the blood
Knows that some drugs mimic the molecules involved in transmitting nerve or hormone signals, and therefore disturb normal operations of the brain and body

Standard – Understands the conditions necessary for maintaining good physical health and why they are necessary
Benchmarks –
Knows that the body can sometimes "mistakenly" attack some of its own cells
Knows that body parts or systems may work poorly for entirely internal reasons, such as a faulty gene: some genetic diseases become evident only when an individual has inherited a certain faulty gene from both parents (who may never have shown signs of the disease themselves)
Knows that the environment may contain dangerous levels of substances that can be harmful to humans
Knows that new medical techniques, efficient health care delivery systems, improved sanitation, and a fuller understanding of the nature of disease give today's humans a better chance of staying healthy than their forebears had
Knows that most people now live in conditions that are very different from the conditions under which the species evolved; some of the differences may not be good for health

Standard – Understands how germ theory differs from earlier notions about what causes illness and how germs were discovered and linked to disease
Knows that today, high-power imaging and biotechnology make it possible to investigate how microorganisms cause disease, how the immune system combats them, and how they can be manipulated genetically

Standard – Understands some aspects of good mental health and the conditions that promote it
Benchmarks –
Knows that people differ greatly in the ways in which they attempt to cope with emotions
Knows that ideas about what constitutes good mental health and proper treatment for abnormal mental states vary from one culture to another and from one time period to another

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED IN HEALTH UNITS –

Science as Inquiry
Indian students should develop an understanding about science inquiry as a specific process/framework for investigating natural phenomena in order to infer how similar, but not necessarily identical, processes- involving skills such as acute observation, formulation of hypotheses, classification, measurement, and communication – were used by different American Indian peoples in the past to investigate and explain natural phenomena.

Life Science
Indian students should develop an understanding of how atoms and molecules cycle among living components and relate that to traditional tribal paradigms such as the Circle of Life, the Beauty Way, the Red Road, etc.
Indian students should develop an understanding of the fundamental tension between living organisms' capacity for infinite growth and the finite nature of environments and resources and to relate knowledge of this tension to traditional American Indian values about ecology.
Indian students should develop an understanding of the chain of plant and animal life and relate this knowledge to the traditional American Indian beliefs about the interdependence of living things.

Science and Technology
Indian students should develop an understanding of the importance of knowledge about science and technology as it applies to contemporary Indian communities.

Science in Personal and Social Perspectives
Indian students should develop an understanding of factors – including cultural beliefs and values, historic/contemporary practices – that contribute to their tribe or community's overall health.

Indian students should develop an understanding of historic and contemporary contributions of American Indians to current knowledge about conservation and healthy ecological practices and how these relate to application of modern science and technology in local, regional, national and global circumstances/problems.

History and Nature of Science

Indian students should develop an understanding of science as it is practiced by American Indian scientists and science/technology related professionals in their communities.

Indian students should develop an understanding of various opportunities for science careers in heath and health/related fields.

Indian students should develop an understanding of American Indian contributions to science in such areas as medicine, botany, psychology and ecology.

INDIAN ART

There are artists in every Indian tribe. This has always been the way. Every tribe probably had something only they made – a special way of showing their artistic talent. Indian people used things in their natural environments to make art objects. That's one reason Indian art is not the same in one place as it is in another. Over the years culture groups borrowed from each other. Indian artists are still at work making things that tell us about their tradition. Some Indian artists are borrowing from the art of the past or from other tribal groups to create something brand new. Pieces of Indian art help us understand what cultures were like and are like today. Indian people have found many ways to express their love of beauty and their creative talents and have used science in their endeavors.

LITERATURE FOR INDIAN ART UNIT –

Native Artists of North America by Reavis Moore.

Patrick Desjarlait: Conversations with a Native American Artist by Patrick Desjarlait **(Indian Author and Artist)**, Runestone Press. **Ojibwa**

Contemporary American Indian Artists by Dawn Reno.

R. C. Gorman-**Navajo** Artist, Available from Four Winds Books, York, NE.

Tending the Fire, The Story of Maria Martinez by Juddi Morris. **Pueblo**

This Song Remembers: Self-Portraits of Native Americans in the Arts ed. by Jane Katz, Houghton-Mifflin, 1980.

Artists and Craftspeople, American Indian Lives Series, available from Four Winds Indian Books, York, NE.

All My Relations: Sharing Native Values Through the Arts by Catherine Verall and Lenore Keeship-Tobias. Canadian Alliance in Solidarity with Native Peoples, 1988.

Sea and Cedar by Lois McConkey, Firefly, 1973. **Northwest**

Morning Star Quilts by Florence Pulford.

The Star Quilt, a Symbol of **Lakota** Identity by Marla N. Powers, Lakota Books, 1990.

Simply **Seminole**: Techniques and Designs in Quiltmaking by Dorothy Hanisko.

Indian Basketry by George Wharton James.

Basketry by E. J. Christopher.

American Indian Basketry by Otis Tufton Mason.

Native American Beadwork by Georg J. Barth.

Complete Guide to Traditional Native American Beadwork by Joel Monture (**Indian Author**).

The Technique of Porcupine Quill Decoration by Wm. C. Orchard.

Navajo Rugs by Don Dedera.

Weaving a Navajo Blanket by Gladys A. Reichard.

Making North American Pottery by Michael Simpson (**Indian Author**).

Zuni: A Village of Silversmiths by James Ostler, Marian Rodee and Milford Nahohai (**Indian Author**), 1996.

Native America: Arts, Traditions & Celebrations by Christine Mather.

Check your libraries for other books on Indian art.

ACTIVITIES FOR INDIAN ART UNIT –

1. Have the students learn about Indian art, read cultural materials and hear cultural perspectives relating to this topic, and experience Indian art through observation and projects.
2. Have the students research Indian art objects from the local tribe(s) and their history.
3. Have students visit local museums and other displays of Indian art. Who are some tribal artists? Have them visit the class and explain their art.
4. What science was utilized in the making of various art objects? What math was utilized? What math is utilized in marketing art objects?
5. Have the students research the cost of Indian art. Have students learn that many artists are self-employed and the economics of that. Some Indian artists work for others. What sorts of jobs might they have?
6. Have students select various types of Indian art, read about it and read about artists that do that kind of art.

7. Have the students do various art projects.
8. Have students draw conclusions from their study of Indian art and display them along with their art projects at the Tribal office or other public place.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University and the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Adapt these activities to meet the needs of your students. Review the science standards for this unit. They will suggest further science and math activities.

Louise Bigmeat Maney

by Lillie Larch

Louise Bigmeat, a Cherokee, grew up on the Qualla Boundary of the Eastern Cherokee Nation located in Western North Carolina. As a little girl of four or five years of age, Louise recalls that pottery making was a family affair. She recalls that her older brother would hitch up the steer to their sled and the whole family, including Louise and three older sisters would travel to a place on Soco Creek near Macedonia Church. There the family dug clay out of the ground and put it into sacks. Then they hauled it home which was three or four miles away. It seemed a long trip in those days. The trip was hot and dusty and the main Soco road was unpaved.

Once the clay was home, it was spread out on the ground to dry. When dry, the clay was pounded with hammer stones until it was a coarse powder. Then it was put into water and allowed to set. Bits and pieces of sticks, grass, and leaves would float to the top where they were removed. This process usually took a week or longer. The bits of grass, sticks and leaves that float to the top of the water-clay mixture are less dense than water. That is why they float. Things that are more dense than water would sink. Density is a scientific term that means mass (or for our purposes, weight) divided by volume. The equation for this is written D=M/V. The density of water is 1 gram (g)/milliliter(mL) which means that 1 gram of water takes up 1 milliliter of space. The density of the floating materials must be less than than 1 g/mL then.

It is important to remove foreign materials like leaves and grass because if they are not removed the pottery would probably crack when fired because different materials expand at different rates when heated.

When the pot was completed, it was decorated. Cherokee pottery tools were very simple, consisting of a smooth river stone, a small piece of pointed stick used for incising, and a carved wooden paddle which was slapped against the sides of the pottery. A common paddle design was the checkerboard pattern. After the designs had been added to the pottery, it was allowed to dry for a few days, depending on the weather.

When the pottery was dry, it was rubbed and polished inside and out using the river stone. The stone was kept wet by constantly dipping it into water. As the wet stone is rubbed against the clay pot the rough surface is smoothed. The particles of clay that stand out are removed by polishing. The water on the stone makes it easier to move the stone against the clay (reduces friction) and also washes away the particles of loosened clay. The smooth surface of the clay is flat and this changes its reflective properties. It is much like polishing wooden furniture except the rough surfaces are filled in rather than worn off.

When a number of pottery pieces had been completed, they were ready for firing. Clay is fired or dried with heat so that it will not decompose. If clay is just air-dried it will crumble and return to mud if it is mixed with water. When clay is fired a chemical change occurs (clay is converted to ceramic) but when it is air-dried a physical change occurs. Clay is earth but not all earth is clay. Clay is hard when it is dry but sticky and slippery when it is wet. Clay is earth that is made of decomposed granite called feldspar. Feldspar is a mixture of silicates including these two common chemical formulas: $K_2O \cdot Al_2O_3 \cdot 6SiO_2$ and $Na_2O \cdot Al_2O_3 \cdot 6SiO_2$. Clay is found in many places because granite covers much of the earth's surface.

When Louise was a small girl, two methods of firing were being used on the Qualla Boundary. One quick method, to save time was to fire the pottery in the cook stove. The other method Louise described was one using an outside fire. This was the traditional method. A hole was dug in the bank. A fire was built in the hole (dirt makes great insulation). The pottery was placed near the fire and as the pottery heated, it was moved closer to the fire. When the pottery was hot it was placed face down in the hot coals and bark was placed on top. This was left to burn overnight. When the ashes cooled the pottery was removed. Pieces would often break during the firing process because the pots were heated too quickly or unevenly and thus some areas of the pots expanded more quickly than other areas.

Louise states that sometimes her family used the cook stove method and sometimes a combination of the two methods were used. The pottery was first heated in the oven and then fired outside. Today Louise fires all of her pottery in an oil drum.

There is an interesting facet of the firing process which involves the burning of different types of wood. Clay found on the Qualla Boundary is white clay. When pots made from white clay are fired using hard woods such as locust or oak, the pottery takes on pink or grey tones. When soft woods such as pine are used the pottery is dark or black. (Hard wood refers to the wood of deciduous trees while soft wood refers to the wood of coniferous trees. The terms hard wood and soft wood have nothing to do with the texture of the wood.) This is because different woods produce different temperatures when they are burned. The firing temperature affects both the appearance and the strength of the pottery. Oftentimes unusual effects are achieved in the blending of tones. The results of firing pottery in this method can be observed in present day pottery.

Pottery making has been very much a part of Louise's life. She was selling her own pottery by the time she was seven years old. Louise also has two older sisters who make pottery and the name, Bigmeat Pottery, is recognized by many. Louise states that during her teen years she stopped making pottery. But she married and took up pottery making again. The one difficulty Louise faced with her pottery was selling it. She had to sell her pottery because she needed the income; but she found it demeaning to have to approach the shops and ask the owners to buy her pottery. She would have to accept whatever they paid her. Her one desire concerning her pottery was to have people come to her and ask to buy her pottery.

Louise has worked at the Cherokee Elementary School for the past nineteen years as a paraprofessional. She is a member of the cultural heritage committee there and because of her desire to teach pottery to the children, she took classes at Western Carolina University located near Cherokee. There she learned to make pottery using the wheel. Three years ago Louise and her husband, John Henry, opened their own shop on Soco Road and are doing very well in their business. Much of their pottery is made on a wheel and an oil drum is used for firing. The clay is also bought commercially. When talking to Louise she said, "Finally people are coming to me to ask to buy my pottery."

One main concern that Louise has today is that the young people are not learning traditional crafts. She wants to get a cultural center started at school or elsewhere if she has to, where children can go and learn pottery making and other traditional crafts. By doing so some of the Cherokee heritage will remain alive.

CONTENT QUIZ

1. Where did the Cherokee people get their clay?

2. Why was pottery making called a family affair with the Bigmeat family?

3. Why did the sticks and stones have to be removed from the clay?

4. Why didn't the early Cherokees use the quick method to make pottery?

5. What tool was used to polish the pots before the firing?

6. What is meant by polishing the pottery?

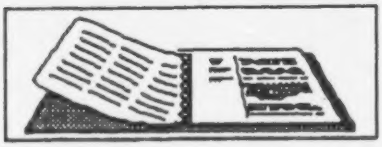
7. Tell what would happen if the pottery was not heated before it was placed in the hot coals.

8. What two types of woods are used for firing the pottery?

9. Explain what effect soft woods and hard woods have on the pottery.

10. Why does Louise want to teach children to make pottery?

11. What tools were used in Cherokee pottery making?



VOCABULARY EXERCISES

Look at the words on the left. Find the correct definition from the list on the right. Match each word to the correct definition.

_____1. blend

_____2. coarse

_____3. coil

_____4. culture

_____5. cylinder

_____6. depression

_____7. effect

_____8. heritage

_____9. incising

_____10. kiln

_____11. method

_____12. mold

_____13. pottery

_____14. tones

_____15. traditional

a. an oven for drying or hardening pottery

b. a form of civilization, particularly the beliefs, arts, and customs

c. the regular way of doing something

d. objects molded from clay and fired by intense heat

e. below the surface

f. having large particles

g. to mix together smoothly

h. general shape; form

i. a series of connecting rings

j. the culture that is passed down from one generation to another

k. something produced by a cause

l. something handed down by past generations

m. tints or shades of color

n. making or cutting into with a sharp tool

o. a long, round object

Mary Charley Rafael

by Nancy R. Yazzie

Mary was born in Manuelito, New Mexico on August 15, 1915, of the Mexican clan. She knew only her mother; her father died when she was very young. She is a descendant of Chief Manuelito's second wife. She married Steven Charley at age 14 and lived with him for ten years. After Steven died, she married Tom Rafael. She herded sheep and wove rugs for a living. Her husband then became a councilman for the Navajo Tribal Government in 1956 and during this time Mary learned how to work with silver and make jewelry for the traders.

Mary is a woman of many talents. In addition to ranching, (Mary raised sheep and cattle and also trained riding horses and work horses because there was no one else in her family to do it.), weaving, and jewelry making, she is also an herbalist and a medicine woman.

As a silversmith, rings are a favorite of Mary's. To make a ring you need 24 gauge silver for the bottom plate, 30 gauge silver for the bezel (bezels are frames for stones) and half round silver wire (round on one side, flat on the other thus . . . half round) for the shank. The sizes of the plate, bezel and shank all depend upon the size and design of the ring.

Designs such as leaves can be cut from bottom plate scraps. Balls are easy to make because as silver scraps are heated the silver melts and forms naturally into spheres.

To join the parts of the ring together they are soldered. Soldering requires silver solder, flux and an acetylene torch. Flux is a substance applied to prevent oxide formation and facilitate flowing. Beginning jewelers often work with copper rather than silver as they learn the art. Copper is much less expensive and yet it has a melting temperature (1083° C) that is somewhat close to that of silver (961° C). The malleability (ability to be hammered into various shapes) of copper and silver is similar making the transition from copper to silver easy.

To put the ring together, you size the bezel around the stone you are going to use. Apply flux with a fine paint brush to the area to be soldered. Carefully heat the silver and fluxed area. When the flux is heated and starts to blend over the silver, lightly touch silver solder to the joined area. The solder should quickly melt, soldering the two edges together. Be careful not to heat it too much or it may melt. Make sure the bezel fits the stone before soldering it onto the bottom plate. After the bezel is soldered to the plate, you can design your ring using leaves and silver balls. The shank has to be flattened out about a quarter of an inch from the end and filed to smooth out the rough edges. Then the shank is shaped on the ring size (mandrel). After the top piece is designed to specification, it is finally soldered onto the shank. The finished product is then cleaned in a solution of sulfuric acid (H_2SO_4), rinsed and dried. Finally the stone is put into the bezel. The ring is now ready to be polished.

The thickness of silver wire or sheet is measured with a wire gauge. The gauges of silver used for rings and bracelets range from 18-30. The smaller the number, the thicker the plates are. The larger the number, the thinner the plates are. The concept of these numbers can be compared with fractions in mathematics. The smaller the denominator, the bigger the piece. The larger the denominator, the smaller the piece.

The first recorded Navajo silversmithing (around 1853) was done by Atsidi Sani (Old Smith) known to the Mexicans as Herrero Delgadito. He probably learned silversmithing from a Mexican captive. By 1864, there were two or three Navajos making a few silver buttons and bracelets. The first examples included both plain and engraved items. Later crude handmade punches were used to make patterns copied from saddle patterns. The first silver used was obtained from silver dollars furnished by the soldiers at Fort Defiance, Arizona and Fort Wingate, New Mexico.

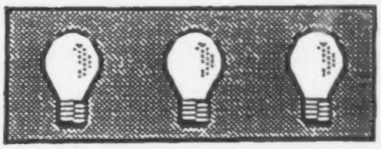
In 1871 a trading post was opened in Ganado and Navajos traded silver jewelry for other items. Leonard, an early owner of the Trading Post, furnished the Navajos with American half-dollars which they used for silver. Colonial artisans also used U.S. coins as the metal for their silver work. About 1890, the U.S. government enforced laws against defacing coins. Another Trading Post owner, John Hubbell, imported Mexican pesos which the silversmiths preferred because pesos were easier to work with than half-dollars due to their higher silver content. Later, the Mexican government forbade the exportation of their pesos so John Kirk of Chinle asked a refinery to send him silver disks the size of a peso. The refinery could not make these but instead sent him small squares of silver weighing one ounce each. By 1932, slugs from Los Angeles' refineries had replaced the pesos. Silver sheets (plates) of various thicknesses were introduced in the late 1920's eventually replacing the slugs. These silver sheets are the ones Mary uses today to make her jewelry.

Silver, a precious metal, is a mineral that is mined from the ground. It is the most purely white of all the metals. Its chemical abbreviation is Ag from the Latin word for silver, argentum. Because its chemical abbreviation can be found on the Periodic Table of the Elements that means that silver is an element. There are 92 natural elements (can be found in nature) and elements are the simplest form of matter. The metals are located on the left side of the Periodic Table while the non-metals are located on the right side. There are many more metals than non-metals though. Nearly 80% of the known elements are metals. Most metals are shiny. They are good conductors of heat and electricity. Copper (Cu), silver (Ag) and gold (Au) are all metals. Copper and silver are found in the same column in the Periodic Table. Elements found in the same column are said to belong to the same family. They have similar properties such as melting point. Nonmetals are not shiny and are not good conductors. Nonmetals are found nearly everywhere. Oxygen (O), Hydrogen (H) and Nitrogen (N) are all nonmetals.

Silver is the oldest known metal. It was mentioned in Chinese classics as early as 2500 B.C. Silver is a very soft metal although it is harder than gold. Objects made of silver contain varying amounts of other metals to make them hard and durable. For example, sterling silver contains 92.5% silver and 7.5% copper. Silver resists organic acids and is used for lining vats, tanks and other containers in the chemical and food industries. Large quantities are used for electrical conductors, dental fillings and surgical wires and plates. Silver is mined in Idaho, Arizona, Utah and Montana. It comes in the form of ore (which means that it is found with other materials in the ground) and it has to be refined (and separated from the other materials) before it is used in jewelry and other products. Metals are non-renewable resources.

In the early 70's when silver became a booming industry in the Southwest, Mary was asked to teach silversmithing in an Adult Education class for six months. She used copper for her instruction. Many students she taught are making Indian jewelry for a living.

Although she has never attended school, Mary is always willing to share her knowledge and skills in both silversmithing and weaving. Mary's talent for silversmithing is well known in Navajo land. Perhaps one day you will purchase and wear a piece of jewelry that Mary or one of her many students made.



CONTENT QUIZ

True or False

1. The art of soldering is easy for beginners. __________

2. Solder means to join metal together. __________

3. Silver is used to make Indian jewelry. __________

4. You need 24 gauge silver for the bezel. __________

5. You need 32 gauge silver for the bottom plate. __________

6. Heating and soldering temperatures are about the same for silver and copper. __________

7. In the 1800's, the silver ornaments worn by the Navajos were obtained from the Mexicans. __________

8. The Navajos learned silversmithing from the Mexicans. __________

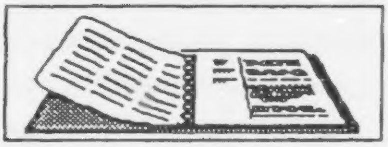
9. Atsidi Sani was the first known Navajo silversmith. __________

10. Silver is no longer used for jewelry. __________

11. The chemical symbol for silver found on the periodic chart is **Fe**. __________

12. Silver is mined in California, Texas and New York. __________

13. A silversmith is a person whose occupation is making and repairing articles of silver. __________



VOCABULARY ACTIVITIES

Define these words and use each word in a sentence.

solder
ornaments
silver
bezel
copper
knowledge
denominator

acetylene
silversmith
shank
flux
precision
ailments
refine

soldering
gauges
ore
weld
transition
specification
mineral

MATH --

"YOUR GUESS IS AS GOOD AS MINE"

CULTURAL OBJECTIVE:

Students will understand how to estimate numbers, volume, and water displacement of culturally relevant objects.

MATH OBJECTIVE:

Students will know how to use whole numbers, fractions, decimals, and percent equivalents interchangeably in making estimates.

TEACHER'S BACKGROUND INFORMATION:

Maize (Indian corn) and beans are shown on a Hopi medallion sharing a circle. They grow together through the center and complete the two halves of the design with their leaves. Beans and maize have a spiritual unity since they grow best together. The cornstalk provided a pole for the beans to climb. The bean roots contain nitrogen-fixing bacteria providing needed elements to the soil for the maize. This is a natural partial symbiosis (a relationship between two species in which each provides something the other can use). This was only one way the Native Americans preserved the fertility of the soil. Maize plants were seen as holy people and were raised with the care one would give a baby. Beans constituted the second staple crop of Southwestern farmers-chiefly kidney, lima, and tepary beans.

Trees were respected and not wasted so as not to offend them. Plants were created before animals. They could exist alone. Each tree contains its own soul-spirit giving it a physical form, growth, and self-healing gift. It could join with other members of its own species to form a corporate spirit. They have many purposes, all of them good. Plants help men in their growth and existence, some heal, others give beauty and inner strength. The fluid of trees is nutritious.

"THE LEGEND OF THE BIRCH TREE"

"The birch tree suffered enormously from the itch; he squirmed, he writhed in discomfort. Though he had enormous limbs, arms, and fingers, he could not scratch. There was nothing the birch tree could do to relieve his sufferings.

In his agony the poor birch called out to the squirrels and porcupines and beavers to pick out the ticks, grubs, and beetles that were tormenting him. But the squirrels and porcupines and beavers were too busy to offer any help. The best they could do was to give their sympathy without limit.

Next the birch called out to the birds. They too felt sorry for the birch, but they could do nothing. Only the woodpeckers came to help. Coming to the aid of the poor tree, the downy woodpecker, his cousin, the red-headed woodpecker, the flicker, and the chickadee all picked every pest from beneath the bark of the birch. The birch tree ceased itching.

Many years later the woodpeckers were in distress. Not knowing what to do or from whom they could find help, they, at last came to the birch and related a sad story. In the long rainless spell, the woodpeckers were dying from thirst. The woodpeckers were unable to drink from pools and lakes and streams, like other birds could.

'Could' they asked, 'you do something?'

The birch, remembering the help that he had received from the woodpeckers said to them, 'Go to my trunk and drill two holes near each other and they will presently fill up with my sap.'

The desperate woodpeckers flew down and drummed away at the trunk of the tree, until they had drilled two tiny holes. Almost immediately the holes began to fill up and yield a rich flow of sap. Thirstily, the woodpeckers drank and they have been drinking from trees since that time.

From the woodpeckers the Anishinabeg learned that trees yield sap and that trees could be tapped. Like the woodpecker, the Anishinabeg tapped the birch for a vinegar tasting drink and later tapped the maple for a sweet drink."

From Native American Science and Mathematics. Don Anderson, Federal Education Division N. A. S. & M.

This story tells how the Cherokees learned how to use clay to make pottery. (Taken from Cultural Curriculum for Communities.)

In ancient times, there lived a kindhearted girl who was good to all living creatures. She was especially kind to insects. She felt they needed protection since most of them were so small. If she found a butterfly caught in a stream, floating unable to fly, she would take the butterfly out of the water and place it on the ground to dry. She was always helping insects who were in trouble.

One day she went to the spring to get some water. She was carrying her bark bucket. This was the kind of bucket the Cherokees used to carry water. These buckets were made of bark and put together with a sticky substance that held the bark together. They were good for carrying water. It took considerable time to make these buckets, so they were used with care. A hard jolt or dropping the bucket would surely break it.

She was careful never to drop the bucket. She bent down to dip her bucket into the spring. She heard a strange buzzing sound. She stood up, trying to locate the sound. It was coming from the spring. She saw a mud dauber wasp stuck in the water. It looked tired and exhausted from trying to get out of the water. It was going in circles. The dauber wasp could not get out of the water. The mud dauber's wings were wet and he couldn't fly. She wanted to help the dauber wasp, but she was afraid. She was afraid it would sting her. She filled her bark bucket with water from the spring. She walked several steps and stopped. She felt bad about leaving the dauber wasp in the water. It would die. She returned to the spring.

She decided to help the wasp even if it stung her. She took a long stick and put the stick down in the water near the wasp. She moved the stick nearer the wasp for him to climb upon. The wasp climbed upon the stick. He looked very wet and tired. She knew his wings were too wet for him to fly. She decided to take the stick out of the water. She placed the stick with the wasp on some dry leaves in the sunshine. It could lie safely in the sun until its wings were dry enough to fly.

She picked up her bark bucket and went home. Her mother was waiting for the water. Sometime later she returned to the spring to get more water. She tripped on some rocks and fell. Her bark bucket flew through the air and shattered into many pieces as it hit the ground. She began picking up the pieces. She didn't know what to do with them. She had been told it took many hours to make a bark bucket. She couldn't make one. She didn't know how, and besides she was told to hurry back with the water.

She began to cry. She sat down on a log and sobbed so hard her tiny body shook. There was a buzzing sound nearby. She couldn't hear the sound for her crying. It was the dauber wasp she had rescued several days earlier. The mud dauber buzzed near her ear. He wanted her to stop crying and hear what he had to say. She finally heard the buzzing sound. She looked down and next to her on the log was a dauber wasp. The dauber wasp wasted no time in speaking for fear she would begin crying again. The dauber wasp said, "Don't feel so badly, I will teach you something very useful. I will teach you to make many things. You will be able to teach your people. You will be of great help to your people."

The dauber wasp told the girl to follow him to the creek. He flew ahead of her. He stopped and landed on the soft clay next to the creek. The girl sat down on a log and watched him. He began to take small lumps of clay from the creek bank. He took these lumps of clay to the log where the girl was sitting. The mud dauber wasp flew back and forth from the log to the creek bank. When he had enough clay to make a small pot, he stopped. He told the girl to watch closely. He began to mold and shape a small pot. The small pot was shaped like an acorn. The dauber wasp had a small wooden paddle. He used the paddle to make designs on the pot. When he had finished, it was a beautiful pot with many small designs on it. He told the girl to remember all he had done in making the pot. He told her to go to her people and share her knowledge with them. The little girl went home. She took the small pot with her. She showed it to her people. She told them of the wise mud dauber wasp. The people in her village were surprised. They had never seen such a beautiful pot. It was a well-made pot. The designs on it were beautiful.

The girl's father listened carefully. He made her a wooden paddle. He carved beautiful designs on it. Next, he went to the creek and got some clay. He worked the clay as the mud dauber wasp had instructed. The girl helped her father. Together they worked all sticks and rocks out of the clay. They let the pure clay set for a while before they shaped and molded it for a pot. They were careful not to forget anything the dauber wasp had said. When they had finished the pot, they patted designs on the outside with the wooden paddle. It was almost like the pot the dauber wasp had made. However, it was much larger. It was large enough to hold water. It would hold as much water as her bark bucket. The girl and her father were happy. This was the beginning of pottery making for the Cherokees. It all began because a little girl was kind to a wise mud dauber wasp.

This Chitimacha legend tells how this Native American tribe of southern Louisiana learned to make dugout canoes:

One day the Great Spirit came and took several men out to the forest and told them to take some mud, place it around the cypress tree about shoulder high, then set the trunk of the tree afire and let it burn until it fell. The mud was packed tight, and the fire could not go above it. When the tree had fallen, He showed them how to pick the right part of the tree and length they needed for a canoe. This accomplished, they were shown how to burn off the bottom and ends, also using the mud pack to control the fire. When the burning was finished, they were told to take clam shells and scrape all the charred part off. The outside complete, the canoe was set upright, a fire was made on the top of the log for the full length. This was left to burn and to the desired depth and if they wanted to stop it from burning too much on the sides they could pack it with mud so the burning could go to the right depth. The canoe was then scraped in the same manner as the bottom. (Taken from The Chitimacha People.)

STUDENT LEARNING ACTIVITIES:

1. Ask students to share all they know about the importance of corn to the American Indian. Show students a 1/2 cup of unpopped corn. Have them estimate how many times the popcorn will increase. Pop the corn and measure.

2. Discuss background information on beans. Estimate how many beans will fill a cylindrical container. Calculate the volume of the cylinder. Count the beans to check the estimate and calculation. Challenge question: Find the average volume of a bean.

3. Tell the legend about the birch tree and discuss it. Estimate the number of leaves on a tree. How can the estimate be checked for accuracy?

4. Tell the legend of how the Cherokees learned to make pottery from clay. Estimate the amount of clay to be used to make a solid figure of a certain size. Make the figure to determine the accuracy of the estimation.

5. Have students each take a ball of clay of equal mass, make different objects and explain the ability to have many different types of objects from the same amount of clay. The groups can compare ideas and examples.

6. Discuss the legend of how the Chitimacha Indian men were taught to make dugout canoes. Explain the difference in weights of canoe and water displacement. Why did different tribes use different materials to make their canoes? Each student could make a birchbark or a dugout canoe. Create a chart or graph to illustrate findings.

7. Talk about the significance of drums to Native Americans. Tell the class they are going to begin the construction of two drums. Have students use two pieces of cardboard the same size. Roll one piece of cardboard horizontally and calculate the volume of the cylinder. Roll the other piece vertically and calculate the volume of the cylinder. How are the two volumes related? Are they the same or different? If different, which one is larger? Check answer by pouring dried beans in each cylinder to see which one holds more.

EVALUATION:

Teacher observation of participation in activities and use of problem-solving techniques is the best evaluation for these lessons.

RESOURCES:

Anderson, Dan. Native American Science and Mathematics. Fond Du Lac, Minnesota: American Indian Language and Culture Education Program, 1987.

Preston, Vera (lesson developed by). Cultural Curriculum for Communitiees. Oklahoma City, Oklahoma: Oklahoma Department of Education, 1989.

Hoover, Herbert T. The Chitimacha People. Phoenix, Arizona: Indian Tribal Series, 1975.

DEVELOPED BY:

Phyllis Darden
Grover Parsons

SCIENCE STANDARDS ADDRESSED IN INDIAN ART UNIT-

Standard – Understands the convictions scientists share about the nature of the world and what can be learned from it

Benchmarks –

Understands how science improves its predictions and explanations of the world through the continuous testing, revising and occasional discarding of theories; this leads to better understanding of the world, but not to absolute truth

Standard – Understands that scientific inquiry works in particular ways

Benchmarks –

Understands that science has different traditions about what is studied and how, but there are shared beliefs in the value of evidence, logic and good arguments, and that progress in science comes from intelligence, hard work, imagination and even chance

Standard – Understands the main individual, social, ethical and institutional aspects of science

Benchmarks –

Understands that science disciplines differ from one another in what they study, their techniques and goals, but share a common purpose and philosophy

Standard – Understands basic concepts about the structure of matter

Benchmarks –

Knows that atoms consist of negative electrons, which occupy most of the space in the atom, and very tiny nuclei consisting of neutrons and positive protons, each almost two thousand times heavier than an electron

Knows that the arrangement and number of electrons determine the properties of an element (see periodic table) and how an atom can interact with other atoms

Knows the rate of reactions among atoms and molecules depends on the concentration, pressure, and temperature of the reacting materials and a suitable catalyst

Knows that the properties of a molecule are determined by the number and types of atoms it contains and how they are arranged

Knows that shapes are particularly important in how large molecules interact with others

Knows that substances can be represented by formulas or three-dimensional models showing the number, types, and/or relative positions of the atoms that make up the substance

Standard – Knows the forms energy takes, its transformations from one form to another, and its relationship to matter

Benchmarks –

Knows that heat energy in a material consists of the disordered motions of its colliding atoms or molecules

Knows that some changes of atomic or molecular configuration require an input of energy, whereas others release energy

Standard – Understands the nature of the Chemical Revolution
Benchmarks –
Knows that Dalton's modernization of the ancient Greek ideas of element, atom, compound, and molecule strengthened the new chemistry by providing a physical explanation for chemical behavior that could be expressed in quantitative terms
Knows that the advancement of chemistry since the time of Dalton and Lavoisier now makes possible an explanation of the bonding that takes place between atoms during chemical reactions in terms of the inner workings of the atoms
Knows that chemical change can be explained in terms of rearrangements of atoms, which is made possible by the breaking and forming of chemical bonds
Knows that chemical reactions can be classified into general types based on the nature of the changes involved (acid-base, oxidation-reduction, precipitation, polymerization)

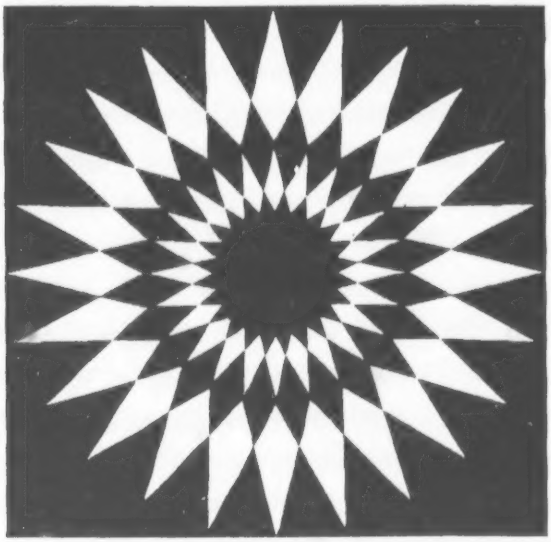
AMERICAN INDIAN STANDARDS ADDRESSED IN INDIAN ART UNIT –

Science as Inquiry
Indian students should develop an understanding about science inquiry as a specific process/framework for investigating natural phenomena in order to infer how similar, but not necessarily identical, processes – involving skills such as acute observation, formulation of hypotheses, classification, measurement, and communication – were used by different American Indian peoples in the past to investigate and explain natural phenomena.

Physical Science
Indian students should develop an understanding of structure and properties of matter and be able to discuss analogies/differences between empirical and traditional American Indian concepts about matter; for example, discussing the electrical force in atoms in relation to the Algonquian concept of Manitou, or the interactions of energy and matter in relation to the traditional representation of earth, air, fire and water as parts of the Medicine Wheel.
Indian students should develop an understanding of chemical reactions and be able to apply this knowledge to traditional American Indian technologies such as processing of natural materials to make dyes or the firing of clay to make traditional Indian ceramics.

Science and Technology
Indian students should develop an ability to propose hypothetical science and technology problems/solutions inherent in the development of traditional American Indian technologies such as used in Indian art.

History and Nature of Science
Indian students should develop an understanding of science as it is practiced by American Indian people in their communities.
Indian students should develop an understanding of various opportunities for science careers.



✷ BACKGROUND
✷ MATERIALS
✷ ACTIVITIES
✷ STANDARDS
for
History/Social Studies-Based Units

HISTORY/SOCIAL STUDIES

The units on history/social studies will help Indian students understand their backgrounds and realize their rich histories, cultures and uniqueness.

Many states require that information on Indian history/culture of the tribes in that state be taught. Many Indian schools require that a course(s) on their own tribe(s) be taught. For these purposes, the materials focusing on the various tribes for the first unit will be helpful. They should be coupled with other available resources - written, audio-visual and human – to verify information and to provide for a complete study of the tribe(s).

Especially in Indian schools, general Indian history should be taught. If there is no separate class on general Indian history, that history should be woven in with regular history in Indian schools and in all schools. Or the Indian history teacher and the regular history teacher(s) should collaborate and coordinate their efforts. The literature teacher(s) could also coordinate their instruction with Indian history content. The following resources are recommended for the teaching of general Indian history:

Indian Country: A History of Native People in America by Karen D. Harvey and Lisa D. Harjo (**Indian Author**), North American Press, 1994.

The Encyclopedia of Native America by Trudy Griffin-Pierce.

Timelines of Native American History by Carl Waldman, Prentice-Hall, 1994.

North American Indians by Herman Viola.

Lasting Echoes: An Oral History of Native American People by Joseph Bruchac (**Indian Author**), 1997.

A to Z of Native American Women by Liz Sonneborn.

Extraordinary American Indians by Susan Avery and Linda Skinner (**Indian Author).**

Maps of American Indian Tribes or of North American Indians or atlases available from Four Winds Books, York, NE.

The Chronology of Native North American History by Duane Champagne, ed., Gale Research, 1994.

Native American Tribalism: Indian Survivals and Renewals by D'Arcy McNickle (**Indian Author**), Oxford University Press, 1973.

Native Time: A Historical time Line of Native America by Lee Francis (**Indian Author**), Saint Martin's Press.

ACTIVITIES FOR THE UNITS -

1. Engage students every way possible. "Read the chapter and we'll discuss it" is not a good way to teach. Neither is lecturing all the time. Chapters can be read aloud together, or parts of chapters – a chapter does not have to be read at one time. Students can be assigned to be responsible for reporting on various parts of a chapter or on various books. Books, chapters or parts of chapters can be read after discussion or other activities rather than only before.

2. Instruction should include field trips, guest speakers, projects, audio-visual aids, higher order thinking questions, and how happenings in history affect the lives of Indian people today.

3. Students can be provided questions for which they are to find answers by using various resources and give presentations with visuals, perhaps Power Point presentations, indicating their findings.

4. Review the American Indian standards for U.S. History. The explanatory narratives included provide ideas for activities that make happenings in history relevant to the lives of individual Indian people and tribes today.

5. If a particular aspect of history, i.e. the Lewis and Clark expedition, had particular relevance to the local tribe(s), special research projects, interviews of elders, reenactments, making of videos, etc., should be included.

6. Special attention should be given to such subjects as sovereignty, water rights, Self-determination, etc., especially as they impact local tribe(s).

HISTORY/LIVES OF TRIBAL GROUPS

The following are to be used in a study of the tribes of the state and/or the local tribe(s).

Books by Virginia Driving Hawk Sneve (**Indian Author**), on various tribes, Holiday House. Title include The **Iroquois**, The **Navajos**, The **Nez Perce**, The **Seminoles**, The **Sioux**, The **Hopi,** The **Cheyennes,** The **Apaches,** and The **Cherokees**.

Indian Nations Series, Raintree (**Includes Indian Authors**) includes books on various tribes.

Indians of North America Series ed. by Frank W. Porter, Chelsea House. Includes many books on various Indian tribes, The **Yankton Sioux**, The **Crow**, The **Coast Salish**, The **Apache**, The **Aztecs**, The **Cherokee**, The **Cheyenne**, The **Chickasaw**, the **Chumash**, The **Comanche**, the **Iroquois**, The **Mohawk**, The **Navajos**, the **Nez Perce**, the **Ojibwa**, the **Pueblo**, The **Seminole**, The **Wampanoag.**

First Americans Series by Facts on File includes **California** Indians, Indians of the **Plains**, Indians of the **Arctic and Subarctic**, Indians of the **Plateau and the Great Basin**, Indians of the **Northeast**, Indians of the **Southeast,** Indians of the **Pacific Northwest** and Indians of the **Southwest**.

Scholastic Encyclopedia of the North American Indian by James Ciment and Ronald LaFrance.

The **Choctaw** Nation by Allison Lassieur, 2001.

Navajo History by Ethelou Yazzie (**Indian Author**), Rough Rock, 1971.

The **Wampanoags** of Mashpee by Russell Peters (**Indian Author**), Indian Spiritual and Cultural Training Council, 1987.

Migration of the **Iroquois** by Ray Fadden, Tehanetorens (**Indian Author**), White Roots of Peace, 1972.

The **Zunis** by K and D. Doherty, Franklin Watts, 1993.

The **Wabanakis** of Maine and the Maritimes: A Resource Book about **Penobscot, Passamaquoddy, Matiseet, Micmac** and **Abenaki** Indians, AFSC, 1989.

The Mishomis Book: The Voice of the **Ojibway** by Edward Benton Benai (**Indian Author**), Red School House, 1979.

We Are **Mesquakie**: We Are One by H. Irwin, Feminist Press, 1980.

The **Yaqui**: A People and Their Place by F. S. Molina, Arizona Humanities Council.

The Story of the **Cherokee** People by Tom Underwood.

Red Thunder by Dave Matheson (**Indian Author**). **Couer d'Alene**

People of the Ice by Jillian & Robin Ridington.

Indians of the **Northeast** by Colin G. Calloway.

Indians of the **Northeast** Woodlands by Beatrice Seigel.

The **Woodland** Indians by C. Keith Wilbur.

People of the Three Fires: The **Ottawa**, **Potawatomi** and **Ojibway** of Michigan with teacher's guide available from Four Winds Indian Books, York, NE.

Ojibway Family Life in Minnesota by Priscilla Buffalohead, Anoka-Hennipen Indian Education Program.

The Lasting of the **Mohegans**: The Story of the Wolf People by Melissa Jayne Fawcett (**Indian Author**), Mohegan Tribe, 1995.

Land of the Four Directions by Frederick J. Pratson, Chaatham, 1970. **Passamaquoddy, Micmac, Maliseet**

Inuit by Ulli Steltzer, University of Chicago, 1982.

The **Sioux** Today by Frank LaPointe (**Indian Author**), Macmillan, 1972.

Pochee Goyo: History and Legends from the **Shoshone** by Rupert Weeks (**Indian Author**), Jelm Mtn. Press, 1981.

From the Heart of the **Crow** Country: The Crow Indians' Own Stories by Joseph Medicine Crow (**Indian Author**), Orion, 1992.

The Sun Came Down: The History of the World as My **Blackfeet** Elders Told It by Percy Bullchild (**Indian Author**), Harper & Row, 1985.

Pretty Shield: Medicine Woman of the **Crows** by Frank B. Linderman, University of Nebraska Press, 1962.

The Way to Rainy Mountain by N. Scott Momaday (**Kiowa**), University of New Mexico Press, 1969.

Black Elk Speaks by John G. Neidhardt, University of Nebraska Press, 1988. **Lakota**

Storyteller by Leslie Marmon Silko (**Laguna Pueblo**), Seaver, 1981.

Cheyenne Memories by John Stands in Timber (**Indian Author**), and Margot Liberty, University of Nebraska Press, 1972.

Saanii Dahataal: The Woman Are Singing by Luci Tapahonso (**Navajo**), University of Arizona Press, 1993.

Two Leggings: The Making of a **Crow** Warrior by Two Leggings ed. by Peter Nabakov, Crowell, 1967.

Fools Crow by James Welch (**Blackfeet**/Gros Ventre), Viking, 1986.

American Indian Stories by Zitkala-Sa (Gertrude Simmons Bonnin, **Yankton Sioux**), University of Nebraska Press, 1985.

Generation to Generation by Edward Benton-Benai (**Anishinabe**), Red School House, 1991.

Night Flying Woman by Ignacia Broker (**Ojibway**), Minnesota Historical Society, 1983.

Goodbird, the Indian by Edward Goodbird (**Hidatsa**), Minnesota Historical Society, 1985.

When Buffalo Ran by George Bird Grinnell, University of Oklahoma Press, 1966. **Cheyenne**

The Ways of My Grandmothers by Beverly Hungry Wolf (**Blackfeet**), Quill Press, 1982.

The Middle Five: Indian Schoolboys of the **Omaha** Tribe by Francis La Flesche (**Indian Author**), University of Wisconsin, 1963.

The **Osage**, Children of the Middle Waters by John Joseph Mathews (**Indian Author**), University of Oklahoma Press, 1961.

My Indian Boyhood and My People the **Sioux** by Luther Standing Bear (**Indian Author**), University of Nebraska Press, 1988 and 1975.

Yellowtail: **Crow** Medicine Man and Sun Dance Chief by Thomas Yellowtail (**Indian Author**), University of Oklahoma Press, 1991.

Buffalo Bird Woman's Garden by Waheenee (**Hidatsa/Mandan**) translated by Gilbert Wilson, Minnesota Historical Society, 1987.

Waheenee: An Indian Girl's Story by Waheenee (**Hidatsa/Mandan**) translated by Gilbert Wilson, University of Nebraska Press, 1981.

The People Named the **Chippewa**: Narrative Histories by Gerald Vizenor (**Indian Author**), University of Minnesota Press, 1984.

Waterlily by Ella Cara Deloria (**Yankton Sioux**), University of Nebraska Press, 1988.

Indian Boyhood and Old Indian Days by Charles A. Eastman (**Santee Sioux**), Fawcett, 1972.

Madonna Swan: A **Lakota** Woman's Story by Mark St. Pierre, University of Oklahoma Press, 1991.

Standing in the Light by Severt Young Bear and Theis. **Lakota**

Lame Deer, Seeker of Visions by Lame Deer (John Fire, **Lakota**) and Richard Erdoes, Washington Square Press, 1972.

Our Grandmothers' Lives As Told in Their Own Words by Freda Akenekew and H.F. Wolfort, Fifth House, 1992. **Cree**

The Soul of An Indian by Charles Eastman (**Dakota**), University of Nebraska, 1980.

White Roots of Peace: The **Iroquois** Book of Life by Paul Wallace, Clear Light, 1994.

A Pima Remembers by George Webb (**Pima**), University of Arizona, 1959.

Two Old Woman: An **Alaska** Legend of Betrayal, Courage and Survival by Velma Wallis (**Indian Author**), Epicenter, 1993.

Dahcotah Life and Legends of the Sioux by Mary Henderson Eastman.

Lakota Sioux Children and Elders Talk Together by E. Barrie Kavasch, Power Kids Press, 1999.

Selu: Seeking the Corn Mother's Wisdom by Marilou Awiakta (**Cherokee**), 1993.

Voices and Dreams, Mendicino County Library, 1991. **California**

Kaibah, Recollections of a Navajo Girlhood by Kay Bennett, Westernlore, 1964.

CHECK YOUR LOCAL LIBRARIES FOR BOOKS AND OTHER MATERIALS ON LOCAL TRIBES.

BEFORE 1600

50,000 B.C.	Archeologists believe that this is when people begin to cross the Bering Strait land bridge and dispersed throughout North and South America. But Indian people, in general, and others don't believe this theory. Indian people believe they have always been in the Americas, and nonIndians keep discovering evidence that may refute the Bering Strait theory. Indian people have their own creation stories.
1000 B.C. – 200 A.D.	Adena Mound Building culture in and near the Ohio Valley
300 B.C. – 700 A.D.	Hopewell Mound Building culture in the East
300 B.C. – 1000 A.D.	Mogollon culture in the Southwest
100 B.C. – 1500 A.D.	Hohokam culture in the Southwest
100B.C. – 1300 A.D.	Anasazi culture in the Southwest
700-1700 A.D.	Mississippian Mound Building culture in Southeast
985-1014 A.D.	Eric the Red and Leif Ericson establish settlements in Greenland and North America
1492	Columbus – 5 million Indian people in North America, excluding Mexico.
1513	Juan Ponce de Leon of Spain sailed to Florida.
1528-1536	The Panfilo de Narvaez Expedition of Spain through the Southeast and Southwest
1532-1541	Frenchmen explore the Atlantic Coast and the St. Lawrence River system.
1539-1542	Spanish explore the Southwest, Southeast and Pacific Coast.
1560-1570	The Iroquois League consisting of the Mohawk, Oneida, Onondaga, Cayuga, and Seneca tribes formed by Deganawida and Hiawatha.

1562-1565	The French establish colonies in South Carolina and Florida but are driven out by the Spanish.
1565	The Spanish establish St. Augustine in Florida, the first permanent European settlement in North America.
1568	The Catholic Church starts the first missionary Indian school in Havana for Indian children brought from Florida.
1576-1579	Englishmen explore the Northwest and the California Coast.
1585-1590	Englishman Sir Walter Raleigh established two colonies on Roanoke Island, North Carolina. Both of them failed.
1586	A potato crop was taken to England.
1598	Spaniard Juan de Onate founded colony in New Mexico. Today it is San Juan Pueblo.
1598-1599	Indians of Acoma Pueblo in New Mexico attack Spanish. Juan de Onate and forces kill eight hundred Indians.

LITERATURE FOR UNIT -

Red Earth, White Lies: Native Americans and the Myth of Scientific Fact by Vine Deloria (**Indian Author**), 1997.

Archaeology of Native Americans, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

The Earliest Americans by Helen Roney Sattler, Clarion, 1993.

Clash of Cultures: Prehistory-1638 by Christopher Collier, 1998.

Mounds of Earth and Shell: Native Sites, the Southeast by Bonnie Shemie, 1994.

The Earthshapers: Midwest Moundbuilders by Karen Speerstra.

Ancient Indians of the **Southwest** by Alfred Tamarin and Shirley Glubok, Doubleday.

The Ancient Cliff Dwellers of Mesa Verde by Caroline Arnold, Clarion, 1992.

Mesa Verde/National Park by Ruth Shaw Ladlauer.

Native Americans and Mesa Verde by Hazel Martell, 1993.

Canyon de Chelly: The Story of Its Ruins and People by Z.A. Bradley, National Park Service, 1973.

Cities in the Sand: The Ancient Civilizations of the Southwest by S. Warren, Chronicle Books, 1992.

The Anasazi by Eleanor Ayer, 1992.

Journey to Center Place by Viola Gates, Council for Indian Education.

Children of the Longhouse by Joseph Bruchac (**Indian Author**), Dial, 1996.

Dawn Song by Joseph Bruchac (**Indian Author**), Dial.

A Coyote Columbus Story by T. King (**Indian Author**), Groundwood, 1992.

Rethinking Columbus: Teaching about the 500th Anniversary of Columbus, by Rethinking Schools.

Columbus/His Enterprise by Hans Koning, Monthly Review, 1991.

Hiawatha – Founder of the **Iroquois** Confederacy, North American Indians of Achievement Series.

Hiawatha: Messenger of Peace by D.B. Fradin, McElderry Books, 1992.

The Amazing Potato by Milton Meltzer.

Aztecs, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

Pueblo, Indians of North America Series ed by Frank W. Porter, Chelsea House.

The **Pueblos**, Indians of the Americas Series.

Native Americans and the Spanish, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

THE 1600's AND 1700's

1600	Sheep were brought to the Southwest by the Spanish.
1600-1770	The use of the horse by Indian people spread from Mexico into the Southwest and into the Great Plains.
1607	The English established their first permanent settlement at Jamestown, VA under John Smith.
1609-1613	John Smith captured by Indians. Story that Pocahontas, Powhatan's daughter, interceded on Smith's behalf. Pocahontas is captured by the settlers, marries John Rolfe, travels to England where she dies.
1615	Frenchman Samuel de Champlain attacks Onondaga villages with Huron war party and turns Iroquois League against the French.
1620	The Pilgrims arrive at Plymouth. Squanto had been kidnapped and taken to England earlier and teaches them how to plant corn.
1621	With Squanto acting as interpreter, the Pilgrims make a pact of peace with the Wampanoags and celebrate the first Thanksgiving.
1622	The Powhatan confederacy of 32 tribes under Opechancanough attacked Settlers at Jamestown.
1626	The Canarsee Indians sell Manhattan Island to Peter Minuit, governor of New Netherlands for sixty guilders worth of trade goods.
1627	The Company of New France is chartered to colonize and develop fur trade with the Indians.
1638	Pequot War in New England claims the lives of 600 Indian men, women and children.
1661	The Spanish raid the sacred kivas of the Pueblo people to detroy their culture and religion.
1675-1676	King Phillip, Wampanoag, wages war against the colonies and several other tribes that joined forces with the colonists.
1680	Pueblo Indians revolt against Spanish rule. Spanish return in 1689.
1689-1697	French and Indian War. The Iroquois sided with the English and Algonquin nations with the French.

1703-04	Queen Anne's War between England and France in the Northeast and England and Spain in the South.
1744-1748	King George's War between French and English divides the Indian tribes.
1751	Benjamin Franklin sites Iroquois League as a model for his plan for government.
1755	Iroquois League sides with the British against the French.
1760	War between the colonists and the Cherokee
1761	The Aleuts of Alaska revolt against the Russians.
1763-1764	Chief Pontiac rebels against the English in the Great Lakes region.
1769	California is claimed for Spain and missions were established.
1775-1783	The American Revolution. Declaration of Independence signed in 1776.
1778	The first U.S.- Indian treaty is signed between the U.S. and the Delaware.
1778	The Iroquois, under Joseph Brant, and British regulars attack American Settlers in New York and Pennsylvania.
1779	A counteroffensive against the Iroquois breaks the power of the League.
1781-1789	The Articles of Confederation include the principle that the central government should regulate Indian affairs and trade.
1784	The Congress orders the War Office to provide troops to assist the Commissioners in their negotiations with the Indians.
1787	The Northwest Ordinance calls for Indian rights, the establishment of reservations and the sanctity of tribal lands.
1789	Congress establishes a Department of War and grants the Secretary of War authority over Indian affairs.
1787-1789	The Constitution contains the power to regulate commerce with foreign nations, among the states, and with Indian tribes.
1794	The Battle of Fallen Timbers takes place. Miami and Shawnee defeated.

LITERATURE FOR UNIT –

Clash of Cultures: Prehistory – 1638 by Christopher Collier, 1998.

Pocahontas – **Powhatan** Peacemaker, North American Indians of Achievement Series.

The Invasion of America: Indians, Colonialism, and the Cant of Conquest by Francis Jennings, Norton, 1976.

Thanksgiving: A Native Perspective by Doris Seale, Carolyn Silverman (**Indian Authors**) and Beverly Slapin, Oyate, 1996.

King Phillip – **Wampanoag** Rebel, North American Indians of Achievement Series.

Pontiac – **Ottawa** Rebel, North American Indians of Achievement Series.

Joseph Brant – **Mohawk** Chief, North American Indians of Achievement Series.

The **Iroquois** by Virginia Driving Hawk Sneve (**Indian Author**), Holiday House.

Iroquois, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

Indian Roots of American Democracy by Jose Barreiro, ed., Akweson Press, 1992.

The Great Law of Peace and the Constitution of the United States of America, Akwesasne Notes.

A Simple and Informative Guide to Understanding Treaties by Jan Hare (**Indian Author**)

A Mission for the People: The Story of Purisima by Mary Ann Fraser, Henry Holt, 1998.

A Time of Resistance: **California** Indians During the Mission Period, 1769-1848,by Sarah Supahan, Klamath-Trinity Joint Unified School District, 1992.

Digger: The Tragic Fact of the **California** Indians from the Missions to the Gold Rush by Jerry Stanley.

Indians, Settlers and Slaves in a Frontier Exchange Economy: The Lower Mississippi Valley before 1783 by Daniel H. Usner, Univ. of North Carolina Press, 1990.

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Great Native Americans by Peter Copeland.

Turtle Meat and Other Stories by Joseph Bruchac (**Indian Author**), Holy Cow Press.

1800 TO 1868

1802	Congress appropriated funds to "civilize and educate" Indian people.
1803	The Louisiana Purchase adds a large Indian population to the U.S.
1803-1806	Lewis and Clark expeditions open up the West.
1809-1811	Tecumseh, a Shawnee chief, tries to unite tribes against the U.S.
1809-1821	Sequoyah creates the Cherokee alphabet. In 1830, the Cherokees started their own educational system using the alphabet.
1812-1815	The War of 1812 between the U.S. and England. Tecumseh is killed.
1813-1818	Andrew Jackson takes Creek lands, invades Florida to punish Seminoles.
1830	The Indian Removal Act calls for relocation of eastern Indians to Indian Territory west of the Mississippi River.
1831-1839	Five Civilized Tribes of the Southeast relocated to Indian Territory.
1832	The Bureau of Indian Affairs is organized as part of the War Department.
1845-1853	The Spanish Southwest and its many Indian tribes become part of U.S.
1848-1849	Gold discovered in California, destruction of California and Plains Indians.
1849	Bureau of Indian Affairs is transferred to the Dept. of Interior.
1851	The Treaty of Ft. Laramie between the U.S. and Northern Plains tribes.
1853-1856	U.S. acquires 174 million acres through 52 treaties, all broken by whites.
1858-1859	Gold is discovered in Colorado.
1864	The Navajo people are forced on the "Long Walk" to Bosque Redondo.
1864	Three hundred Cheyenne and Arapaho killed at Sand Creek Massacre.
1865	Government gives contracts with missionaries to start Indian schools.
1866-1868	War for the Bozeman Trail includes Sioux, Cheyenne and Arapaho under Red Cloud. Second Ft. Laramie Treaty.

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1869 TO 1899

1868-1869	Southern Plains War involves Cheyennes, Sioux, Arapahos, Kiowas and Comanches.
1869	President Grant's Peace Policy instituted. Lasts until1871.
1869	Ely Parker (Seneca) becomes first Indian Commissioner of Indian Affairs.
1869	Transcontinental railroad is completed, joined at Promontory Point, UT.
1871	Congress passes law forbidding further treaties with Indian tribes.
1871	Western Indians not to leave reservations without permission of agents.
1871	White hunters begin wholesale killing of buffalo.
1874	Gold discovered in the Black Hills of South Dakota. Miners ignore treaties.
1876-1877	Sioux War for the Black Hills under Sitting Bull and Crazy Horse.
1876	Battle of the Little Bighorn. Custer defeated.
1877	Nez Perce under Chief Joseph take flight.
1878	Congress provides for Indian police.
1879	Richard Pratt starts Carlisle Indian School in Pennsylvania to assimilate Indians. Start of government boarding schools.
1881	Sitting Bull and his band surrender at Ft. Buford, North Dakota.
1881-1886	Apache resistance under Geronimo in the Southwest.
1885	The last great herd of buffalo is exterminated.
1887	Congress passed the Allotment Act (Dawes Act) and gave individual Indians parcels of land and opened up surplus to whites.
1890	The Ghost Dance Movement led by Wovoka (Paiute) gains influence. The Wounded Knee massacre in South Dakota.
1890-1910	The population of Indians fell to a low point of less than 250,000 in U.S.

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1900 TO 1952

1902	The Reclamation Act encourages settlement of the West.
1906	The federal government seized 50,000 acres of wilderness land including the sacred Blue Lake of the Taos Pueblo.
1909	Teddy Roosevelt issues executive order transferring 2.5 million acres of Indian timber lands to national forests.
1910	U.S. government forbids the Sun Dance among Plains Indians.
1911	The Society of American Indians was formed as an activist group.
1914-1918	Many Indian people enlisted in the armed forces during WWI.
1917-1920	Many Indians lost their lands to corrupt Anglos.
1921	The Dept. of Interior responsible for Indian education and social services.
1924	Congress awarded American citizenship to all Indians. Some had already obtained it.
1928	Charles Curtis, Kaw Indian and U.S. Senator, was elected vice-president under Hoover.
1928	The Merriam Report deplored Indian living conditions and declared the allotment system a failure.
1934	The Wheeler-Howard Act provides for tribal ownership of land and tribal self-government.
1941-1945	Twenty-five thousand Indians served in active duty during WWII. The code talkers used their language as a code the enemy couldn't decipher.
1944	The National Congress of American Indians was organized.
1946	An Indian Claims Commission was created to settle tribal land claims against the U.S.
1949	The Hoover Commission recommended termination of the federal-Indian trust relationship.
1952	BIA program for voluntary relocation of Indians to urban areas for work.

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1953 TO 2000

1953-1956	The Termination Resolution. Sixty-one groups were terminated.
1953	Congress empowered certain states to have law and order jurisdiction of Indian reservations without the consent of the tribes.
1961	Tribes allowed first opportunity to purchase individual Indian lands.
1961	Keeler Commission on Rights, Liberties and Responsibilities of the American Indian recommended self-determination/resource development
1964	The Office of Economic Opportunity was created and provided anti-poverty programs on reservations.
1964-1968	The Civil Rights Act led to the decree that states cannot assume law and order jurisdiction on reservations without the consent of tribes..
1968	American Indian Movement founded.
1968	President Johnson calls for self-determination to replace termination.
1969-1971	Indians occupied Alcatraz Island in San Francisco Bay.
1970	A federal policy of Indian self-determination was formulated.
1970	Blue Lake Wilderness Area in New Mexico returned to Taos Pueblo.
1972	AIM occupies and destroys BIA offices in Washington, DC.
1973	AIM and Oglala Sioux occupied Wounded Knee for 71 days.
1974	Federal Acts provided housing and loans to Indians for businesses.
1978	Indian activists organized the "Longest Walk" to Washington, DC.
1978	The American Indian Freedom of Religion Act passed.
1988	The Indian Gaming Act was passed.
1992	Indian people throughout the Americas protested the celebration of the Columbian Quincentennial.
2000	Indian population in U.S. 4 Million-U.S. Census

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MATH AND SCIENCE -

"Water Rights"

TEACHER'S BACKGROUND INFORMATION:

The intent of this section is to touch briefly on a few of the high points concerning the origins, present status, and unresolved issues surrounding water rights.

Native American tribes in recent years have become increasingly aware of the value of their remaining land base. Along with this new awareness, greater emphasis has been placed upon the importance of the resources on and under the land. Among the resources, water is of critical importance. Indeed, in many cases, without the water, the land itself is without value. The importance of water, particularly in the arid lands of the Western United States, cannot be over-emphasized!

A. Water Laws

In the early treaties between the United Sates and the various Indian tribes, the subject of water was not specifically mentioned. The Europeans who settled the eastern seaboard found a climate very similar to that which they had left in Europe. Abundant rainfall made water plentiful.

1. Riparian Doctrine

The water law which evolved in this setting was similar to that of Western Europe, which was riparian usage. The landowners bordering a stream all had an equal right to share in the waters of that stream. In the eastern United States, the system worked very well.

Riparian doctrine is still the law of the eastern United States, although more intensified water usage caused by population growth and industrial demand is bringing about a slow evolution to greater control of quantities and uses of water by the respective states.

2. Appropriate doctrine or "appropriation"

With the migration westward, however, new approaches in dealing with water rights were necessary. The invasion of these lands by miners seeking their fortune precipitated the establishment of a water doctrine which is uniquely American--the doctrine of prior appropriation.

Miners rarely discovered mineral ore immediately adjacent to flowing streams. Yet, for the ores to be processed, quantities of water were necessary.

The miners constructed elaborate conveyance systems to bring water from areas of supply to areas of need. Under riparian law, these conveyances would be unallowable because the place of use did not border the stream. The lands in the west were arid; the miners were the first users of water in the area. The practical solution to their water problems, the appropriation doctrine, evolved into law.

Under the appropriation doctrine, the first water user in time has the best water right; the second most senior water user has the next best rights. Water users do not necessarily have to be along the streams but can use canals or pipelines to convey the water from the source or supply to the area of need.

In times of water shortage, the most junior water user is the first to have to stop diverting. If the stream flow dwindles until there is only enough for the most senior appropriator, then he receives the total flow of the stream.

3. Federal Reserved Rights

In 1908, the doctrine of Federal "reserved rights" was first enunciated in the "Winters v. United States (207 US 564) case. The United States brought suit against non-Indian water users along the Milk River in Montana to restrain them from constructing or maintaining dams or reservoirs which would prevent water from reaching the Fort Belknap Indian Reservation. The non-Indians claimed the right to the water under prior appropriation through the laws of the State of Montana.

Winters v. U. S. was eventually decided by the United States Supreme Court. In its decision, the court stated that when the Indian Reservation was formed, there was reserved or confirmed not only the land, but also the right to enough water to irrigate the irrigable portions of the reserved lands or otherwise fulfill the purposes of the reservation.

After fifty-odd years of controversy over the legal principles and ramifications espoused in Winters, the U. S. Supreme Court strongly reemphasized the doctrine of Federal reserved rights in "Arizona v. California" (373 US 546) decision in 1963:

"The Court in Winters concluded that the Government, when it created that Indian Reservations, intended to deal fairly with the Indians by reserving for them the waters without which their lands would have been useless. 'Winters' has been followed by this court as recently as 1939 in U. S. v. Powers (305 US 527).

We follow it now and agree that the United States did reserve the water rights for Indians effective as of the time the Indian Reservations were created."

Arizona v. California was an original action filed in the Supreme Court of the United States in which the basic question or controversy was how much water each state (California, Arizona, and Nevada) had a legal right to use from the Colorado River and its tributaries. The United States intervened on behalf of the Indian and Federal interests along the lower river.

One of the findings of the Special Master appointed to hear the case, and affirmed by the court in its decision, was that in creating the Chemehuevi, Cocopah, Yuma, Colorado River and Fort Mohave Indian reservations, the U. S. reserved enough water from the Colorado River to irrigate the irrigable parts of the lands

(commonly referred to as "PIA" or practicably irrigable acreage reserved for future as well as present needs. Such water rights were entitled to priority based on the date of reservation establishment.

With this decision, the Supreme Court confirmed the doctrine of a Federal reserved water right to Indian reservations created by Acts of Congress and Executive Orders. The Winters decision determined water rights for reservations created by treaties.

The "Winters Doctrine" is based entirely upon judicial decisions. There is no body of statutory authority governing the reserving of water for Indian reservations.

B. WATER ISSUES

Water Rights for agricultural purposes on Indian reservations have been judicially recognized. Other beneficial uses, however, also exist.

Like their counterparts in non-Indian communities, tribes may wish to use water for fishery maintenance, recreation, municipal and industrial purposes, or other reasons. Such desires add a new facet to the subject of Indian water rights.

A singular example was the litigation over water on the Pyramid Lake Indian Reservation in western Nevada.

The Pyramid Lake Paiutes inhabited the area around Pyramid Lake long before the coming of the non-Indians. Fishing is their livelihood since time immemorial.

With the development of the Newlands Reclamation Project on the Truckee River in 1905, Pyramid Lake began to recede. Truckee River water that once flowed into Pyramid Lake was diverted by the Newlands Project to the Carson River watershed. Since the first diversion, the lake receded by some 90 feet.

Increased salinity caused by lake evaporation and sedimentation problems caused by the now unstable river channel have complicated the Pyramid Lake Paiute Tribe's problems. More recently, the Fallon Paiute Shoshone Tribe and Walker River Tribe, have entered into litigations concerning their water rights--these reservations are also recipients of water flowing down the Truckee river. Agricultural production is the main concern of the Fallon Paiute Shoshone Tribe. The Walker River Tribe's main concerns are agricultural and recreational.

The Pyramid Lake litigation, "United States v. Nevada" (463 US 110) was fought over the issue of whether or not the Pyramid Lake Paiute Tribe has the right Truckee River water for stream and lake maintenance to preserve their fishery.

The legal precedent established by the eventual court decision may have implications and ramifications to other Indian tribes in other geographical areas.

Modern day technology has created still other water questions for American Indian tribes.

For example, when the Navajo Indian Reservation was created, most Colorado River water was inaccessible because its flow was entrenched deep in the canyon of the river. Dam construction and enormous investment now make the water more readily available. As a consequence of technological advances, this shift in water availability poses new questions as to the scope of the reserved right. Such issues have not been resolved.

C. Groundwater

Groundwater, until recently, has been a little used natural resource. Judicial or congressional determination of Indian rights to groundwater has not been made. In a 1976 Supreme Court decision, "United States v. Cappaert" (426 US 128), the existence of a federally reserved right to groundwater was first enunciated. This decision allowed for the protection of an existing groundwater pool from diminishment by outside pumping in the Devil's Hole National Monument. At stake was the survival of one species of desert pupfish which is found only in Devil's Hole.

In "United States v. Papago Indian Tribe v. City of Tucson" (Civ. No. 75-39; P.L. 97-293 [1982]), the Papago Indian Tribe's issue was to establish an Indian right to the underflow and groundwater of the Santa Cruz River in southern Arizona.

The Papago Indians have been farming on the site of their present reservation since time immemorial. Within recent years, non-Indian water use upstream has caused the Santa Cruz River to be a dry channel through the reservation reach except in time of flood.

Off-reservation groundwater pumping has become too great as to cause the groundwater underlying the reservation to flow off. From 1940 to 1965, the decline in the groundwater table underlying the reservation was at an average rate of 2.5 feet per year. Since that time, the rate of decline has averaged 10 feet per year. This drastic drop in the groundwater level has hampered current farming efforts on the reservation. Through litigation, the tribe and the United States as trustee are striving to establish a reserved right to groundwater for Indian reservations.

As in the Pyramid Lake litigation, the legal precedents established by the eventual court decision may have value to other Indian tribes in other geographical areas.

The leasing of Indian water is yet another area which needs to be addressed. Many tribes and individuals feel they should be able to lease their water if they are not now using it on the reservation. This issue is touched upon in the National Water Commission Study of 1973. The Wind River Tribe in Wyoming and the Fallon Paiute Shoshone Tribe are presently exploring the possibilities involved, although, there are many problems to overcome.

D. Water Rights Priorities

Since their admission to the United States as territories, the western states have organized and adopted water statutes which meet the needs and desires of their citizens. Arizona and Oregon adopted initial appropriation systems as early as 1864; other states acted later with South Dakota completing the process in 1907.

Based on this statutory authority, the orderly development of each respective state's water resources was made possible. Water rights priorities were established and accepted--each state having its rights evolve in a slightly different time and in a slightly different way. Certificate of Right were issued to individual water users; conflicts between users were settled in the state courts within the statutory framework established by the separate states.

All seventeen western states developed comprehensive water right statutes reflecting the appropriation doctrine prior to the Supreme Court decision in Winters v. U. S.

The effect of the Winters decision was not immediately apparent. The Reclamation era began in the west with the passage of the Reclamation Act of 1902. Projects were pushed for each of the western states with each state striving to broaden its economic base with agricultural development.

For more than half a century, the United States Government found itself moving in dissimilar positions in regard to water rights. On the one hand, the Government lent backing to the reclamation projects, operating under the appropriation doctrine.
On the other hand, the Government was also trustee for Indian rights and was bound to follow Winters.

Down through the years the two lines may have touched, but they did not really come together until the Arizona v. California case.

E. Water Conflicts

The conflict between states and Indian water right claims has been, is, and will be enormous. Indian water rights are a threat to some established state water rights. The uncertainty of the total scope of Indian rights has created a great uncertainty for state water administrators.

The debate focuses on the question of quantum. The U. S. Supreme Court in the Arizona v. California decision, suggests that the right can be fixed by reference to the number of irrigable acres located on the reservation (PIA). This leaves unanswered the question of what will happen should the reservation see another use other than irrigation (?) requiring a greater supply of water?

The water rights of many tribes and individuals have not been quantified. Some groups have urged against quantification--others have favored quantification.

The Bureau of Indian Affairs has a trustee's responsibility to protect and conserve the Indian water resource until the tribes themselves decide on a future course of action.

E. Current Trends

As can be seen in this brief overview, the issues are many and complex. There have been many proposals on how to deal with the problems involved. Comprehensive treatment of the subject is the present day issue (refer to references and the preceding lesson, "Water: Culture/History" for more information).

Lloyd Burton, author of "American Indian Water Rights and the Limits of Law" (1991), provides recent insights and updates on various litigations concerning water rights. In his opening pages, he quotes, "...Navajo Tribal Chairman Peterson Zah, describing his tribe's efforts to ensure water supply. 'When I was a kid in geography class, I was taught that water always flows downhill, ...What I've learned since is that water flows to money and power, wherever they may be.' ...The remark casts light on the fundamental interrelationship between environmental and social policy in the United States. The 'life, liberty, and pursuit of happiness' of every social group in our country is inextricably linked with the question of how we should inhabit our environment and partake of the natural riches it provides. ...There has been a tendency to treat decision making in resource management and environmental protection as if these actions were somehow structurally separable from their social consequences."

CULTURAL OBJECTIVES

Students will:

develop an understanding of the interrelationship between environmental and social policy as it pertains to Native Americans

develop a working knowledge of legislative decision making and process regarding Tribal resource management and environmental protection

analyze and make decisions based on Native American cultural values and heritage.

MATH OBJECTIVES

Students will:

be able to estimate quantities based on standard units of measurement

be able to construct and interpret graphs, tables, and charts.

SCIENCE OBJECTIVES

Students will:

research, gather, and analyze data

understand and apply information and concepts

will be able to develop and predict outcomes based on hypothetical situations.

STUDENT LEARNING ACTIVITIES:

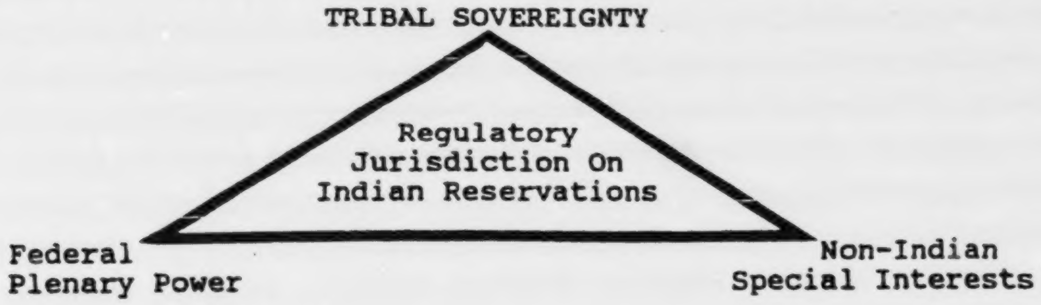
1. Have the students debate contemporary issues that arise in the process of negotiating and authorizing Indian water rights settlements keeping in mind that there are no absolute solutions.

   Use the following suggested topics for debate--the format focuses on key issues, what points should be brought out during debate, and suggested conclusions that can be drawn (see Attachment B).

2. Have the students do a mock trial of the Supreme Court.

   Ever since Indian reservations were established, conflicts have existed over jurisdiction within their boundaries. Over the past two centuries, the U. S. Supreme Court has handled dozens of cases involving fights over whose laws has effect.

   Students should demonstrate the three (3) major forces weighed by the Supreme Court in deciding jurisdictional disputes in Indian Country. The following concept can serve as a basis for selection of students in advocating a particular role keeping in mind that there are no specific number of key players or witnesses--all students can be assigned a role.


TRIBAL SOVEREIGNTY
Regulatory Jurisdiction On Indian Reservations
Federal Plenary Power
Non-Indian Special Interests

(Note: This model is based on the model provided in "Tribal Water Management Handbook, 1988, American Indian Lawyer Training Program, Inc., 319 MacArthur Boulevard, Oakland, CA 94610.)

At the top of the triangle lies "TRIBAL SOVEREIGNTY," which acts to keep regulatory jurisdiction with the tribe to the exclusion of state law, and to a lesser degree of federal law. The next component of the triangle is "FEDERAL PLENARY POWER," a concept that provides Congress with broad discretion to impose laws and regulations upon tribal vertex lies "SPECIAL INTERESTS," such as BLM, BOR, DOE, Fish & Wildlife, ecologists, biologists, Solicitor's Office, hydrologists, ecologists, and other agencies or key players as needed.The state is not a key player in this instance--the Supreme Court uses the state to implement its laws.

3. Have the students perform a PIA ANALYSIS (Practicable Irrigable Acreage). (Based on the PIA Analysis as outlined in the "Tribal Water Management Handbook, 1988. American Indian Lawyer Training Program, Inc., 319 MacArthur Boulevard, Oakland, CA. 94610)

Identifying practicably irrigable acreage is a complex and costly task. It involves extensive investigations by hydrologists, soil scientists, economists, agronomists and engineers who must coordinate their efforts in the laboratory, office and field.

Various strategies for assessing PIA can be formulated, each usually embodies the following components:

1. Identify arable land on the reservation (i.e. land amenable to sustained agricultural use).

2. Determine feasible cropping patterns on the arable land.

3. Calculate the amount of irrigation water needed by the crops.

4. Design an irrigation network sufficient to deliver the required water.

5. Compare the costs of production to crop income in order to establish the acreage that is economical to irrigate.

6. Have the students do a simplified cross-matrix.

This matrix will provide a way for the students to consider systematically the impacts of all future feasible water uses on all existing reservation resources.

This matrix will be used in hypothetical situation(s) and will employ creative and critical thinking skills.

The impact of each use on each resource can be evaluated in terms of whether it is seen as positive, negative, or neutral; whether the impact is profound, moderate, or insignificant; and, whether it is short-term or long-lasting.

Across the top of the matrix is an abbreviated list of the reservation resources inventory. On the lefthand side of the matrix is the list of future feasible water uses identified. The matrix helps the planner predict or "map out" the probable impact of each future feasible use on each existing reservation resource (see Attachment C).

EVALUATION:

Students will demonstrate their knowledge of Native American water rights and its interrelationship between environmental, social and political policy in the United States through:

1. Discussion in a historical context
2. Role playing
3. Definition of key terms
4. Citation of major landmark cases.

Students will be able to create a reservation and hypothetically analyze its feasible water uses by using a simplified cross-matrix.

Students will be able to identify the various components involved in performing a PIA Analysis.

RESOURCES:

American Indian Resources Institute (1988). "Tribal Water Management Handbook". American Indian Lawyer Training Program, Inc., 319 MacArthur Boulevard, Oakland, CA.

Arizona v. California (1963). (373 US 546) U. S. Supreme Court.

Bureau of Indian Affairs (1978). "Indian Water Rights: A fact book" (Document). U. S. Government Printing Office, Washington, D. C. (Stock No. 024-002-0063-2).

Burton, L., (1991). American Indian Water Rights and the Limits of Law. University Press of Kansas, Lawrence, Kansas.

House Reports (January 25-December, 1982). United States Government Printing Office, Washington, D. C. United States Congressional Serial Set (Serial Number 13482).

Little, Joe (June, 1993). "Water Rights" (Workshop presenter). Native American Math and Science Workshop, Haskell Institute, Lawrence, Kansas.

United States v. Cappaert (1976). (426 US 128) U. S. Supreme Court.

United States v. Nevada (1983). (463 US 110) U. S. Supreme

Court.

United States v. Powers (1939). (305 US 527) U. S. Supreme Court.

United States Congress (January 30-31, 1989 and February 1, 1989). "Federal Government's Relationship With American Indians" (Hearing before the Special Committee on Investigations). Select Committee on Indian affairs. U. S. Government Printing Office, Washington, D. C. (S. Hrg. 101-126, Pt. 1 - 11)

United States Senate (June, 1984). "Indian Reserved Water Rights" (Report). Committee on Energy and Natural Resources. U. S. Government Printing Office, Washington, D. C. (S. Prt. 98-280).

United States Senate (April, 1989). "Indian Water Policy" (Hearing). Select Committee on Indian Affairs. U. S. Government Printing Office, Washington, D. C. (S. HRG. 101-142)

Winters v. United States (1908). (207 US 564) U. S. Supreme Court.

U. S. HISTORY STANDARDS ADDRESSED –

Standard -Understands the status and complexity of pre-Columbian societies of the Americas

Benchmarks -

Understands the culture and agricultural practices of Native American societies along the eastern seaboard and in the Southwest where the first North American interactions occurred with the English and Spanish explorers

Standard -Understands the long-term consequences of the meeting of three worlds from the beginnings to 1607

Benchmarks -

Understands the redistribution of the world's population and the catastrophic losses of indigenous populations of the Americas, largely to diseases

Standard -Understands how the European colonies in North America were peopled in the colonial period (1585-1763) and how the colonists interacted with Native Americans and with one another

Benchmarks -

Understands how relations between colonists and Native Americans varied between that characterized by William Penn's peaceful relations with the Delaware chiefs to such extents as the Pequot massacre in 1637

Understands how European wars drew the English colonists along with their Indian allies into conflict with the Indian allies of Spain and France

Standard - Understands how the values and institutions of European economic life took root in the colonies

Benchmarks -

Understands the natural setting that Europeans found and the manner in which they began to shape and exploit the American land (e.g., alteration of the continent's plant and animal life, the concept of land as a commodity)

Standard -Understands the causes and character of the American Revolution, the ideas and interests involved in forging the revolutionary movement, and the reasons for the American victory

Benchmarks -

Understands the major stages of the Revolutionary War and the reasons for the American victory including the role of American Indian leaders

Standard -Understands how the American Revolution changed or maintained social and economic relationships among the nation's many groups and regions, and how these relationships changed from 1754-1815

Benchmarks -

Understands the revolutionary goals of different social groups including Native Americans and the Revolution's transformation of social, political, and economic relationships among them

Standard -Understands how American external relations changed during the Revolution and in the era of the early republic (1754-1815)
Benchmarks -
Understands the relations between the new American nation and Native Americans after the Revolution (e.g., the series of military campaigns and treaties that transferred Indian title of much of the Old Northwest territory to the new nation)

Standard -Understands U.S. territorial expansion between 1800 and 1861, and how this involved changing relations with external powers and Native Americans
Benchmarks -
Understands the frontier as a zone of cultural interaction between Native Americans already in the region and new arrivals moving westward from the eastern U.S., northwrd from Mexico, and eastward from Asia
Understands19th century federal policy toward Native Americans, including the crisis of 1829 following Jackson's election, and removal of the six southern nations to the western territories

Standard -Understands how massive immigration and internal migration after 1870 led to new social patterns, conflicts, and ideas of national unity amidst growing cultural diversity between 1870 and 1900
Benchmarks -
Understands how the Homestead Act of 1862 fueled the expansion of migration on the Great Plains and the Second Great Removal of Native Americans

Standard -Understands the foundations established during the 1920's for the nation's political economy and culture
Benchmarks -
Understands that large parts of the U.S. population, including Native Americans, were left outside the era of opportunity and advancement

Standard -Understands social changes in American society brought about by the Civil Rights movements
Benchmarks -
Understands the parallel civil rights movements of Hispanic and Native Americans (e.g., the rise of the United Farm Workers, Native American struggles for restoration of land and water rights)

- McRel Compendium of Standards, 1994.

AMERICAN INDIAN STANDARDS FOR HISTORY ADDRESSED –

The student understands the patterns of change in indigenous societies in the Americas up to the Columbus voyages.

The student is able to draw upon data provided by archaeologists and geologists to explain the origins and migration from Asia to the Americas and contrast them with Native Americans own beliefs concerning their origins in the Americas.

Indian students should understand that Native Americans believe that their origins are in the Americas and that these beliefs are exemplified by the many and varied creation/origin stories of different tribes. Students should also note that these beliefs conflict with the anthropological theory known as the Bering Strait theory. Students should be able to note problems with the Bering Strait theory, such as the matter of when Indians would have had to arrive in the Americas – specifically, either 40,000 or 12,000 years ago, which are the periods of the last two Ice Ages in which the land bridge opened up across the strait. Some scientists have found evidence of Native American people living here tens of thousands of years earlier. At the very least, students should understand that humans were in the Americas at the time that humans and Neanderthal man were living in Europe.

The student is able to trace the spread of human societies and the rise of diverse cultures from hunter-gatherers to urban dwellers in the Americas.

It should be noted that many American Indian people feel that the term "rise" is biased and unfair when used to describe changes in or evolutions of cultures. It forces a qualitative assessment of the histories of diverse Indian civilizations, and invites comparisons among them.

Indian students should understand that thousands of years before the Columbian voyages, Native American societies existed across a wide spectrum of cultural patterns, including small to large groups of hunter-gatherers, as well as small to large agricultural communities. Students should know that cultures were influenced by geographic and environmental resources. Native American communities were not static, but changed as they adapted to new resources and technologies. Some of these new technologies wee corn agriculture, ceramic pottery-making and stone/metal tool-making. Students should be able to reconstruct the historical patterns of succession and movement of these technologies.

Indian students should be able to explain that although certain Native American cultures may have been small hunter gatherer bands, their cultures were quite complex in terms of their languages, philosophies of ecological relationships, astronomical knowledge, and knowledge of plants/medicines. Students should be able to trace the trade networks that stretched across America for thousands of miles. For example, turquoise from the

Southwest was graded for shells and parrot feathers from the Yucatan Peninsula in Mexico. Great Lakes copper was traded for corn, conch shell and other goods from the lower Mississippi River and Gulf area. Obsidian from the Rockies and pipestone from Minnesota were traded as far east as present-day Ohio.

The student is able to explain the common elements of Native American societies such as gender roles, family organization, religion, and values and compare their diversity in languages, shelter, labor systems, political structures, and economic organizations.

Indian students should know that for thousands of years before the Columbian voyages, Native Americans had engineered a variety of complex and rich societies. Students should be aware of and compare the diversity among the various Native American culture areas across the Americas. They should also understand the cultural history of their respective tribes prior to 1492. Prior to 1492, there were at least 4.4 million – and perhaps even 10 million – Native Americans in North America (excluding Mexico) speaking over 200 languages. Students should know that in Mexico and Central America there were at least 27 million – and perhaps even 50 million – people speaking at least 350 languages. Students should know that in the Caribbean area and South America there were at least 20 million – and perhaps as many as 45 million – people speaking over 1,000 languages. Students should be aware that some tribes/cultures lived under governing systems that included women in roles as leaders.

The student is able to explore the rise and decline of the Mississippian mound-building society.

Indian students should understand that by 750 AD an agricultural society of Native Americans flourished along the Mississippi River valley and its tributaries. This culture is now known as the Mississippian Mound-builder culture, so named for the earthen mounds they built and on which they constructed large ceremonial temples and rulers' residences. The culture reached its zenith in about 1200 AD – the large city known as Cahokia had a population of about 50,000. Located along the banks of the Mississippi near present-day St. Louis, Cahokia was dominated by a huge earthen mound standing over 100 feet in height, with a base 1,000 feet long and 700 feet wide. The people of the Mississippian culture had a highly developed ceremonial structure, and they farmed a wide variety of plants – amaranth, squash, maize, goose foot, sunflowers. They also used copper in making blades and ornaments. The culture eventually died out, probably due to epidemics of diseases brought by Europeans. Students should understand that the barrage of diseases introduced into the Americas was not necessarily the result of face-to-face encounters between Europeans and Indians. It is more probable that waves of disease, carried by infected Indian traders and refugees from infected villages, resulted in the spread of epidemics from Indian community to community. Students should be able to analyze the multiple causes that brought about the decline of the Mississippi Mount-building society. Students should also be familiar with other large, complex, agricultural societies that existed in pre-Columbian America.

The student understands the differences/similarities among Africans, Europeans, and Native Americans who converged in the western hemisphere after 1492.

The student is able to compare political systems, including concepts of political authority, civic values, and the organization and practice of government.

Indian students should understand that while most European and African societies were ruled by monarchies, most Native American societies were egalitarian in nature. Although not all Native governing systems were egalitarian, leaderships within most Indian groups was a shared responsibility. In very few places in the Americas could a single leader speak for an entire tribe and expect his decisions to be followed. Rather, the more typical form of Native American government embodied concepts such as decision by consensus, representative government, clan structures represented in government, separation of powers, and limited systems of checks and balances. Students should be able to compare and contrast these traditional political systems with their contemporary counterparts elsewhere in the world, as well as with today's U.S. system.

The student is able to compare social organizations, including population levels, urbanization, family structure, and modes of communication.

Indian students should know that scientists now estimate that there were at least 4.5 million people in North America – excluding Mexico – and possibly as many as 10 million, prior to European arrival. For the Western Hemisphere as a whole, there were probably over 57 million people – and possibly as many as 90 million – in contrast with 60 to 70 million people in Europe at that time. Students should understand that European societies lacked waste disposal, had higher densities of people and were affected by widespread plagues for centuries. This is a great contrast to the standard of living in most Native American societies in North America at that time (excluding Mexico) where, for the most part, people lived in small towns (of about 2,000 people) and smaller farming villages. These small towns and villages were much healthier places in which to live that their European counterparts due to the fact that fewer people living in a larger space have much less of an impact on the environment. Students should also understand that in Europe famines were rampant, as opposed to in the Americas where Native peoples enjoyed an abundance of natural resources, as well as cultivated foodstuffs, that were the result of healthy ecological practices. Additionally, in Europe most natural resources (e.g. wood) and most land was held by an aristocracy; therefore the majority of the people were peasants and serfs. These are a few of the contrasts in social organization.

Indian students should, however, also be able to compare the small village life of most Native Americans with the several large urban centers in the Americas which rivaled 15th century European cities in population size; for example, Cahokia (where St. Louis is today) was about the size of Rome (population 55,000); Tenochtitlan in Mexico was about the size of London (population 75,000). Before that time, there were other large cities in Mexico – such as Teotihuacan, which at its peak in 400-600 A.D. had around 200,000 inhabitants. These cities were important centers of large complex societies.

Such societies flourished across the Americas during different periods. Indian students should learn about the cultural and scientific achievements of the Mississippian people, the Hopewell, the Adena, the Mayans, the Aztecs, the Anasazi, and the Hohokam. Students should also understand that American Indian societies were built upon large extended family networks that were organized into other social units, e.g., clans, matriarchal/patriarchal systems, and moiety systems.

The student is able to compare economic systems, including systems of labor, trade, concepts of property, and exploitation of natural resources.

Indian students should understand that European and American Indian economic systems were based on fundamentally conflicting views of how land and natural resources should be exploited. Following biblical injunction, European economic systems were based on "dominion over nature." American Indian economic systems, on the other hand, were based upon building an awareness of ecological relationships and managing natural resources without depleting them. Students should be aware that the European world view feared the natural world (including man's nature) and viewed it as something to be subdued. Thus, forest with their wild animals were cleared for farmlands and quickly over-harvested to near depletion. For example, by 1086, England was only 20% forested – of that, only 2% was virgin forest. There were enormous alterations in the European landscape by the 15th century. European attitudes toward animals were markedly different from those of American Indians. For example, Europeans pursued activities such as sport hunting, bear baiting, cockfights and bullfights – some of which are considered barbaric today. In contrast, hunting practices among most if not all American Indian societies involved respect for the life of the animal being hunted.

The student is able to compare dominant ideas and values including religious belief and practice, gender roles, and attitudes toward nature.

Indian students should understand that most if not all American Indian societies viewed natural resources – including wildlife – as sacred. Native American world views stressed the interconnectedness of all living things. This belief shaped the purpose and scope of natural resource usage and was in sharp contrast with the beliefs of European settlers.

The student understands the stages of European oceanic and overland exploration, amid international rivalries, from the 9th to 17th centuries.

The student is able to evaluate the significance of Columbus' voyages and his interactions with indigenous peoples.

Indian students should understand that Columbus never actually set foot upon, or even saw, North America, let alone "discover" America (i.e., the land area encompassed by the United States). He also did not discover a "New World," but unintentionally came upon a very old land which was well established with sophisticated societies. Students should understand that the Native peoples with which Columbus actually interacted – primarily the Arawaks, Taino, Carib and other tribal groups in the West Indies – were essentially decimated from a population of about a quarter-million to a population of under 20,000 within a span of 20 years. Students should understand that this decimation was not only the result of new diseases, but also the result of systematic and harsh enslavement of Native people.

The student is able to evaluate the course and consequences of the Columbian Exchange.

Indian students should understand that the "Columbian Exchange" had devastating effects on American Indian nations. Both exposure to new diseases, as well as more effective European weapons resulted in the deaths of millions of Indians. Death rates of up to 90% were common among American Indian tribes/nations. Students should also understand that many of today's foods common to Europeans and Americans were originally domesticated, cultivated, or farmed by Native Americans and introduced to Europeans – among these are turkeys, potatoes, corn, chili peppers, tomatoes, pumpkins and squash, avocados, peanuts, pineapple, chocolate, vanilla. Many native objects – such as pottery, basketry, canoes, furs, snowshoes, etc. – were also adopted by early European settlers. Among the European items that were introduced to the Americas were citrus fruits, apples, bananas, peaches, pears, wheat, cabbage, and domesticated animals (cows, sheep, chickens, hogs, horses). American Indian groups quickly adopted items like guns, textiles and metal cookware.

The student understands the Spanish and Portuguese conquest of the Americas.

The student is able to explain and evaluate the Spanish interactions with such people as Aztecs, Incas, and Pueblos.

Indian students should understand that Spanish conquest of the Aztecs and Incas contributed to the eventual decimation of those societies and the destruction of their empires. The Spanish also attempted conquest of the Pueblo Indians of the Southwest, but the Pueblos successfully rebelled in 1680, forcing the Spanish out of what is now New Mexico: however, within 12 years the Spanish resettled in Pueblo country. However, the Pueblos were given land grants by the Spanish crown that were later recognized by the U.S. government under the terms of the Treaty of Guadalupe Hidalgo.

The student is able to describe the evolution and long-term consequences of labor systems such as encomienda and slavery in Spanish and Portuguese America.

Indian students should understand that in Spanish America, Christopher Columbus and his followers enslaved tens of thousands of Indians. In the early 1500s, the legal instution of "encomienda" was developed on the island of Hispaniola, and later spread to other regions the Spanish encountered. Under this system, groups of Indians were assigned to individual Spaniards (known as "encomenderos") to work for them as "free vassals" – in theory, the Indians performed work in exchange for wages and under the requirement that they conduct themselves in the manner of Christians. The encomienda was codified as the Laws of Burgos of 1512. Students should understand that the Spanish made a distinction between encomienda and enslavement – although the effective difference remained slight: encomenderos bought and sold Indians, exploited them in labor, abused them, and treated them as if they were slaves.

The student understands the European struggle for control of North America.

The student is able to analyze relationships between Native Americans and Spanish, English, French, and Dutch settlers.

Indian students should understand that there were some differences in the relationships between Native Americans and Spanish, French, English and Dutch settlers in the 17th and 18th centuries. Spanish interaction with Native Americans can generally be characterized as subjugation by conquest, forced labor, and forced religious conversion. Early French interactions can generally be characterized as more benign: for example, French traders married Indian women, and often lived in Indian communities. However, later French interactions changed to be more similar to those of the Spanish – in other words, they were centered on the religious conversion of Natives, as well as the exploitation of Native American communities and resources. English interactions with Native Americans were generally based on exploitation of Native American lands and resources. Since Indians wee seen as "uncivilized," English religious sects saw little value in saving "heathens," and thus had few qualms about dispensing with them in exchange for property. Later, French and English interactions with various Native groups were based on competing military alliances established to protect their respective colonial and economic interests. Early Dutch interactions were primarily based on the desire to control the fur trade with Native Americans. As English and French alliances with Native groups grew, the Dutch influence was marginalized.

Indian students should understand the roles and actions of key American Indian leaders in forming and responding to tribal relationships with European colonists.

The student is able to compare how English settlers interacted with Native Americans in New England, mid-Atlantic, Chesapeake, and lower South colonies.

Indian students should understand that interactions between English settlers and Native Americans differed in New England, the mid-Atlantic and Chesapeake areas, and lower South colonies. In New England, Native American communities had become small as a result of exposure to European diseases as well as attacks on their villages. Their small numbers rendered them relatively defenseless against English incursions into their territories. In the mid-Atlantic and Chesapeake areas, on the other hand, the early English presence itself was smaller, and thus more precarious. Thus, early relations with Indians were initially relatively amicable. Discontent among the Indians grew, however, as the English presence became more invasive. This discontent resulted in an attack in 1622 by Powhatan warriors on the English in Jamestown. The English then retaliated with such force that they essentially eliminated the Powhatan Confederacy from being any further threat. In the southern colonies, the smaller coastal Indian tribes had been decimated by disease and English attacks. However, because the English were not as strong a presence as they were in New England, large tribal confederacies were able to sustain large communities further inland and away from colonial English settlements.

Students should also understand that the nature of relationships between American Indian tribes and European groups varied. While many relationships were adversarial, other relationships were more peaceful and mutually respectful. For example, in his dealings with the Lenape people of Pennsylvania, William Penn attempted to respect the tribe's rights of land ownership and governing its own people. Unfortunately, after his death, some of Penn's followers adopted an adversarial approach in dealing with the tribe.

The student is able to see how various Native American societies changed as a result of the expanding European settlements and how they influenced European societies.

Indian students should understand that Native American societies and cultures were forever changed as a result of devastating disease, genocide and displacement by European settlements. European expansion and economic activities not only created their own conflict with Native Americans, but also created conflict between Native American groups themselves. Students should learn that European societies were able to sustain larger populations and broaden commerce because of their usurpation and exportation of North American resources – such as foodstuffs and furs.

The student is able to analyze Native American involvement in the colonial wars and evaluate the consequences for their societies.

Indian students should understand that Native Americans were sought as allies by competing European colonial interests in order to boost colonial military strength and to provide valuable tactical knowledge. During the colonial wars, Native Americans often had little choice but to form alliances with one or more of the competing entities. For example, in the Northeast the Iroquois allied themselves with the British; in the South, the Cherokee allied themselves with the Spanish; in the Midwest, several tribes including the Ottawas and Ojibway allied themselves with the French. In most cases, these alliances had devastating effects on the respective Native American groups. Many tribes lost large contingents of their men to warfare. There were also other dire consequences for tribes as the colonial wars played out. For example, when the French were ousted by the British, the tribal allies to the French were stunned. For over a century, they had carefully played a diplomatic game of placing one colonial force against another. Now tribes were left to deal with only one force, the bitter legacy of which was a serious loss of bargaining power. Students should know that heavy retribution was often levied against Native Americans who fought on losing sides of the colonial wars. Executions and tribal displacements were common outcomes for the tribal allies of the losing colonial power. The perspectives of "fair play" were certainly very different among the different players in the colonial wars.

The student understands the factors affecting the course of the Revolutionary War and contributing to the American victory.

The student is able to compare and explain the different roles and perspectives in the war of men and women, including white settlers, free and enslaved African Americans, and Native Americans.

Indian students should understand that, in the early years of the Revolution, both the British and the revolutionaries tried to maintain friendships with Indians living on the edges of colonial settlements. Indian tribes, however, realized that the revolutionaries represented the ever-growing number of farmers who were destroying the Indian way of life. Thus, siding with the British gave Indians a chance to continue fighting the encroaching frontiersmen. For this reason, warriors, in cooperation with the British, made extensive attacks along the frontier borders – particularly in Kentucky, western Pennsylvania and New York. At the same time, American patriots were destroying Indian villages in western New York and in what was to later become Ohio and Tennessee. Students should also understand that, despite the fact Ohio and Tennessee. Students should also understand that, despite the fact that the Continental Congress established Indian commissions – in the north, south and middle states – and agents to deal with Indians, the states still conducted their own relations with Indian tribes.

Indian students should know that because of their strategic location along the Hudson River, the pro-British Iroquois played an especially significant role during the Revolutionary War. Since they formed a wedge between New England and the mid-Atlantic colonies, the Iroquois were able to assist British troops attacking from Canada. In turn, the colonists tried to court other Indian allies, such as the Delaware and Cherokees. As an incentive for their alliance, the colonists promised Indians their own states or representatives in the new government to be formed. These overtures were, however, usually rejected by the tribes. Additionally, students should understand that it is also unlikely that the new government would have followed through with those promises even if tribes had agreed to the plans. Once the Americans won, whether Indian groups had been their allies or ores, they received much the same treatment. Many eastern tribes lost their freedom and their lands, and were slowly displaced or sought refuge with tribes further west. In general, tribal groups were interspersed and many lost their Native languages, and their cultural distinctiveness changed as they were forced to mix with other tribes.

Indian students should understand the roles played by key American Indian leaders – Old Briton (Miami), Pontiac (Ottawa), Joseph Brant (Mohawk), Tecumseh (Shawnee), Pushmataha (Choctaw), Alexander McGillivray (Creek), and Black Hawk (Sauk) – in affecting important events during the American Revolution and subsequent new eras.

The student is able to analyze the terms of the Treaty of Paris and how they affected U.S. relations with Native Americans and with European powers that held territories in North America.

Indian students should be aware that prior to the Revolutionary War, Great Britain had guaranteed protection – as well as territory – to some of its Indian allies; in fact, the Proclamation of 1763 prohibited European settlement beyond the crest of the Appalachian Mountains. However, the British made no reference to any Native land rights when they signed the Treaty of Paris in 1783, in which they surrendered claim to all land east of the Mississippi. When this happened, both the Indians and the British agents representing the crown were shocked at the lack of consideration of Indian rights. The American negotiators, however, felt Indians no longer had rights to any lands. This action was particularly ironic for those tribes who allied with the colonists. The Oneidas – the only Iroquois group allied with the Americans – saw their land base in New York decrease from five million acres, to little more than a thousand even though they had negotiated more than 30 treaties between 1785 and 1842. Students should understand that the Treaty of Paris' ultimate legacy for tribes was continued warfare, particularly for tribes further to the west as the U.S. expanded.

The student understands the Revolution's effects on different social groups.

The Indian student is able to compare the reasons why many white men and women and most African Americans and Native Americans remained loyal to the British.

Indian students should understand that there were many factors affecting Native American loyalties to the British. For example, many tribes had long-established trade relations with the British. These tribes were convinced that the British had greater military strength and, therefore, that tribes had the most to gain for their communities by helping the British win the war. These perspectives and concerns for their people's welfare served as the basis for tribal choices in alliance.

The student understands the international background and consequences of the Louisiana Purchase, the War of 1812, and the Monroe Doctrine.

The student is able to assess how the Louisiana Purchase affected relations with Native Americans and the lives of various inhabitants of the Louisiana Territory.

Indian students should understand that the Louisiana Purchase paved the way for ever-increasing incursions in Native American lands. Since it was almost impossible to acquire land in Europe, landless people in Europe viewed the "new country" as offering them great opportunities – of course, at the expense of Indian lands and lives. As a result of the Louisiana Purchase, the same effects that had already been felt by Indian people along the Atlantic and in other regions like the Southwest would now be felt by tribes in the vast interior regions.

The student is able to assess why many Native Americans supported the British in the War of 1812 and the consequences of this policy.

Indian students should understand that for American Indian tribes, the War of 1812 was seen as their last hope in the face of Manifest Destiny. Tribes supported the British in hopes of containing the young United States. Students should also be aware of the roles played by Tecumseh and his brother Tenskwatawa (the Prophet) who tried to unite Indian tribes in the Midwest against the Americans. Students should be aware of the major impact these two Shawnee leaders had against the Americans and that the British failed to match the tenacity of their Indian allies. It was this tenacious spirit of the Indians that the Americans, after the war, tried very hard to break. When the War of 1812 ended with the 1814 Treaty of Ghent, the real losses were most felt by the Indians. Ironically, while the U.S. still maintained relations with the British after the war, they sought to devastate Indian country.

The student understands federal and state Indian policy and the strategies for survival forged by Native Americans.

The student is able to compare the policies toward Native Americans pursued by presidential administrations through the Jacksonian era.

Indian students should understand that from the time of Washington's administration and up to the late 1820s, the dominant U.S. policy toward Indians was one that attempted to purchase Indian land as cheaply as possible and avoid further war with Indian tribes. It was felt that this policy would benefit both Indians and frontiersmen. Interest in pursuing a "moral" Indian policy largely stemmed from two factors: (1) the early American leaders' grounding in 18th century philosophy regarding the natural rights of man and (2) early American leader's desire that the new nation be an example to the world – beliefs particularly espoused by Thomas Jefferson. Of note, of course, is that this policy of peace and purchase was cheaper for the young nation than an Indian policy of war and conquest would have been. Students should also understand that this "moral" policy established very important precedents for dealing with Indian nations as equals, i.e., negotiating treaties with them for successions of land. These precedents have been key in Indian/Federal relations up to today. Indian students should also be familiar with the Trade and Intercourse Acts of 1790s and their implications for subsequent years.

Indian students should understand that the American plans to "civilize" Indians were based on feelings that the American way of life was the "highest" achieved since classical times. Thus, assimilating Indians into the American way of life was considered the height of generosity. Students should understand that this attitude prevailed until the 1840s and 1850s. At that juncture, the common attitude about Indians changed to the view that Indians were incapable of fitting into American society. Students should also understand that Indian tribes strongly resisted efforts to "Americanize" them. By Monroe's administration in the 1820s, the federal policy had changed to one of trying to exchange Indian lands in the East for lands West of the Mississippi. This policy was made possible by the Louisiana Purchase. By the time of the Jackson administration in the 1830s, the federal policy of Indian Removal – i.e., forced move to the west – was underway. Students should be particularly aware of the constitutional crisis caused when Jackson defied Chief Justice John Marshall's Supreme Court ruling which favored Cherokee claims over the state of Georgia's attempts to enact state jurisdiction over Cherokee lands. Jackson's desired policy ideas had run head long into the Supreme Court's interpretation of constitutional and Indian treaty rights.

The student is able to compare federal and state Indian policy and explain Whig opposition to the removal of Native Americans.

Indian students should understand that the policy of Indian removal was bitterly debated both in Congress and in the public press. The advocates of Indian removal declared that it was the only means of protecting Indians; opponents of removal, led by prominent Whig politicians and Supreme Court Chief Justice John Marshall, argued that justice demanded the protection of Indians' rights as guaranteed by treaty. Students should understand that President Monroe's proposal to initiate the Indian Removal Policy stemmed from his efforts to honor the federal government's promise to the state of Georgia – a promise that essentially guaranteed the federal extinguishing of all Indian title to land within Georgia in exchange for the state ceding its western lands to the federal government. Students should understand that the state of Georgia had been outraged by the Cherokee Nation's adoption of a constitution in 1827 and the tribe's declaration of sovereign jurisdiction over its own territory; the state saw this as an unacceptable challenge to its authority. The discovery of gold within the boundaries of the Cherokee nation only further intensified this state and Indian conflict as Georgia residents wanted access to the gold. Students should understand that the federal policy of Indian Removal, while supposedly proposed as a humane compromise between Indians and Georgians, was in actuality very cruel as implemented under the Jackson administration, and as attested to by the historical accounts of the Cherokee Nation's "Trail of Tears."

The student is able to analyze the impact of removal and resettlement on the Cherokee, Creek, Chickasaw, Choctaw, and Seminole.

Indian students should be able to explain the terrible impact that the Removal Policy had on tribes. Indian people were uprooted from land they had known as their homes for centuries and were forced to leave behind their ways of life as well as the graves of their ancestors. Some of the tribes that were forcibly moved had even fought under General Andrew Jackson in the First Seminole War in exchange for a guarantee that they would not be removed. Ultimately, that guarantee was not honored. A huge number of Indians died along the journey west from exposure and sickness. Tribes were often divided when some members were removed to the west while others hid in order to remain in their homelands. Those individuals who did survive the harsh move had to establish new homes and communities in lands that were totally unfamiliar to them and very different from anything their ancestors had known before. Students should contrast the survival strategies of those tribal groups who were removed with those of Indian groups/families which remained behind in the East.

The student is able to investigate the impact of trans-Mississippi expansion on Native Americans.

Indian students should understand that for most of their daily needs, the Plains tribes, like the Sioux and Cheyenne, relied heavily on the vast buffalo herds which roamed the northern Great Plains. In the 1840s, tensions began to grow between the Plains tribes and the emigrants traveling by wagon along the Oregon Trail. In the late 1840s and 1850s, other trails were created to take miners and settlers to California and Colorado. Settlers also began pouring in to Kansas and Nebraska. The wagon trains and influx of new people began pouring into Kansas and Nebraska. The wagon trains and influx of new people began driving the buffalo away from the traditional Indian hunting grounds. This began to have serious effects on tribal ways of life. Thus, friction between Indians and the new settlers and miners increased and in 1854 resulted in the first open warfare in the West between whites and Indians. By the close of the Civil War, this hemming in of the Plains tribes accelerated even more. Soon, the buffalo herds were totally destroyed by the newcomers and the Plains tribes were forced onto reservations. The cause-and-effect relationship of western expansion had taken a serious toll.

The student is able to explain and evaluate the various strategies of Native Americans such as accommodation, revitalization, and resistance.

Indian students should understand that Native American leaders faced many dilemmas in dealing with the relentless expansion of the United States. In general, the concerns of the tribal leaders had to do with protecting their people and preserving what they could of their ways of life. The strategies they implemented to do this depended on many things – their geographic location, their ability to muster military strength, their strategic importance to the United States, their desire for peace, the treatment they received at the hands of United States citizens and the military, and so on. Military resistance was often a last resort that occurred only when negotiations broke down or earlier treaty promises were broken. Indian students should understand the strategies employed by their own tribes and leaders in dealing with the United States' conquest of their lands. They should evaluate the short and long-term effects of those strategies on their tribes' histories and cultures.

The student understands how the resources of the Union and Confederacy affected the course of the war.

The student is able to describe the position of the major Indian nations during the Civil War and explain the effects of the war upon these nations.

Indian students should be aware that this country's Indian nations did not all take the same side during the Civil War. At least 3,000 Indians fought for the North. On the other hand, the five civilized tribes in the "Indian territory" – the Cherokees, Chickasaws, Choctaws, Creeks and Seminoles – officially joined the Confederate States of America. Since many of their tribal leaders were themselves slaveholders, they were sympathetic to the southern cause. The Confederate States also offered them more than the United States. However, in some cases, loyalties were even split within individual tribes. For example, the Oklahoma Cherokees and the Creeks each had members who formed and participated in military units on both sides of the conflict. This factionalism created deep and long-lasting schisms in the social structure of some tribes.

Indian students should understand that the Civil War resulted in an expanded and more capable military presence in the West. This had an effect on relations between western tribes and the United States, particularly during the 15-20 years following the Civil War.

The student understands how agriculture, mining, and ranching were transformed.

The student is able to analyze the role of the federal government particularly in terms of land policy, water, and Indian policy in the economic transformation of the West.

Indian students should understand that this period saw the end of wars between the United States government and Native Americans. Treaties and federal policies had reduced Native American populations and land holdings to a miniscule fraction of their original size. This resulted in vast tracts of land being available for non-Indian settlement, agricultural development, mining and ranching.

The student understands various perspectives on federal Indian policy westward expansion, and the resulting struggles.

The student is able to identify and compare the attitudes and policies toward Native Americans by government officials, the U.S. Army, missionaries, and settlers.

Indian students should understand that during this period of American history, attitudes and policies toward Native Americans were largely paternalistic and focused on controlling Indians and forcing them to change. Native Americans were basically confined to their reservations and forced to adopt totally foreign ways of life – plow farming and ranching being notable examples. Federal Indian agents exerted a great deal of control on reservation lands. These agents were often corrupt, stealing the annuities and commodities that were intended for the Indian communities. Students should analyze this federal policy of assimilation, that is, forcing Native Americans to adopt the culture and ways of mainstream Americans. This effort was reinforced by various Christian religious denominations, who were given exclusive contracts to send missionaries to certain reservations. Missionaries often used assimilation strategies that were demeaning and brutal. Traditional religious practices were outlawed. This period of American history also saw the advent of the boarding school era, a time in which Native American children were forced to attend schools far from home and family, and where their traditional ways of life were totally banned and severe punishments were exacted for even speaking a tribal language.

Students should consult community oral histories and documents – such as autobiographies or scholarly research – which have recorded American Indian perspectives about these attitudes and policies.

The student is able to compare survival strategies of different Native American societies during the second great removal.

Indian students should understand that during the Civil War the federal government concluded that it was no longer feasible to allow the Western tribes a free existence; rather, it was decided that these Indians would have to give up their traditional nomadic lifestyle and accept living in confined reservation areas. Many tribes – including the Sioux, Northern Cheyenne, Kiowa, Comanche, Southern Cheyenne, Arapaho, and Western Apache – did not submit willingly to this new policy, and they remained largely unconquered until the 1880s. From 1866 to 1886, federal troops campaigned continuously against the Western tribes. Geronimo's Chiricahua Apache band was one of the last to hold out, not capitulating until 1886. Students should also be aware that after the Civil War, the Five Civilized Tribes of the Indian Territory acquiesced to the surrender of the western half of Indian Territory to the national government. This forced ceding of land was the government's penalty on tribes for their earlier alliances with the Confederate states. In fact, the Seminole were forced to cede their entire reservation to the United States. Federal officials wanted the western half of Indian Territory for the express purpose of relocating tribes from other sections of the west.

The student is able to explain the provisions of the Dawes Severalty Act of 1887 and evaluate its effects on tribal identity, land ownership, and assimilation.

Indian students should understand that the Dawes Severalty Act was another government attempt at forced assimilation of Indian people. The Act specifically attacked the important traditional Native American social principal of communal land ownership. Dividing tribal lands among individual owners not only contradicted the traditional Indian concept of communal property, but it also affected tribal identity by undermining tribal cohesiveness. In addition, its implementation eroded the traditional Indian concept of extended family by separating family members from one another, sometimes by many miles. Students should examine the impact the Dawes Act had on their own tribe.

The student is able to evaluate the legacy of 19th –century federal Indian policy.

Indian students should understand that Indian policies of the late 19th century further damaged and brought turmoil into the lives of Indian people who were already reeling from the devastating effects of the Indian wars and forced life on reservations. Misguided attempts at assimilation had the effect of destroying community cohesiveness, undermining the social and cultural fabrics of tribes, and creating a sense of alienation. The actions of this era led to various social ills for many Indian people, including extreme poverty and alcoholism.

Each Indian student should understand the effect of 19th century federal Indian policy on his/her tribe's history – for example, in terms of treaties, warfare and changes in land bases.

The student understands the limitations of Progressivism and the alternatives offered by various groups.

The student is able to evaluate the changing attitude toward Native American assimilation under Progressivism and the consequences of the change.

Indian students should understand that during the last 12 years of the 19th century, the primary vehicle for assimilating Indian people into American society was the education of young Indian people. By and large, reliance on sectarian education came to an end, although mission schools continued to operate along side government schools on many reservations. The Federal government began to encourage local school districts to enroll Indian students; nevertheless, local prejudice against Indians caused school districts to be largely unresponsive to this federal urging. Students should understand that Indian peoples continued to tenaciously resist these efforts to be absorbed into American society. Students should also be aware that in the 1920s a vigorous reaction to these federal assimilation policies was growing among various "Indian rights" societies, spearheaded by non-Indians. The Progressive movement stemmed from the rising interest in the relatively new fields of anthropology and conservationism. The movement became particularly active in response to proposed legislation affecting tribes in New Mexico and Arizona. Since tribal cultures in the Southwest were fairly intact in the early 1900s, they were the subject of considerable interest to artists and social scientists. Progressivist policies de-emphasized total assimilation. Instead, they stressed maintaining as many Indian cultural beliefs and life ways as possible. This change in attitude resulted in a brief attempt to place viable elements of tribal culture into the government school curriculum – most notably in the arts. This Progressive era was short-lived, however, given this country's shift in attention to the problems brewing in pre-World War II Europe and their potential economic and international implications for the United States.

Indian students should be able to explain the significance of the Indian Citizenship Act of 1924, the Meriam Report of 1928, the Indian Reorganization Act of 1934, and the creation in 1946 of the Indian Claims Commission. Indian students should understand That despite passage of the Indian Citizenship Act, many state constitutions did not allow for "Indians non-taxed" to vote in state and local elections. In fact, it was not until Indian veterans returning from World War II brought litigation against states to gain voting rights that many states enfranchised their Indian citizens. In Arizona, for example, this did not happen until 1948; in New Mexico, this did not occur until 1962. Students should also be aware of the impact of World War II – a time when many American Indians first experienced life off the reservation for an extended period of time – on cultural, social and political aspects of tribal life. Students should consult community oral histories and other sources which will provide tribal perspectives about these issues.

The student understands the Second Reconstruction and its advancement of civil rights.

The student is able to evaluate the agendas, strategies, and effectiveness of various African Americans, Asian Americans, Latino Americans, and Native Americans, as well as the disabled, in the quest for civil rights and equal opportunities.

Indian students should understand that in the early 1950s the federal government initiated the Relocation and Termination Policies. The intent of these policies was, once again, to bring Indians into the American mainstream. The Relocation Policy encouraged, through job training programs, the movement of reservation Indians to major urban areas like Los Angeles, Chicago, Denver and Dallas. The Termination Policy's intent was to terminate the nation-to-nation relationship between tribes and the federal government. It resulted in withdrawal of federal support to affected tribes whether or not they wanted or were prepared for this. Responsibility for tribes was transferred to the states in which the tribes were located. In all, termination was imposed on about twelve tribes and bands before lawmakers were convinced by tribes and their allies to abandon the policy altogether.

The student is able to assess the reasons for and effectiveness of the escalation from civil disobedience to more radial protest in the civil rights movement.

Indian students should be able to explain how Native American political activism became especially strong during the 1960s with the founding of various groups, like the National Indian Youth Council, the National Indian Education Association and the American Indian Movement. Radical political actions, such as the takeovers of the Wounded Knee Church at Pine Ridge in South Dakota, and the Interior Department Building in Washington, DC, also helped focus national attention on the deplorable conditions on reservations and in Indian communities in general. This heightened awareness in the American public led to federal legislation designed to improve health, housing, education and economic development opportunities for Native Americans. Students should fully understand how the new federal policy of Self-Determination enabled tribal governments in the 1970s to assert their authority and to take more active roles in their communities and in dealing with the United States government. Through better educational opportunities, more Indian leaders became poised to prevent continuing attacks on tribal sovereignty. Tribes have successfully used the legal system to advance their causes. In addition, they have developed various economic strategies to generate tribal revenue. Students should be able to explain that tribal sovereignty is the nation-to-nation relationship between the United States government and tribes, and that this relationship was established by more than 600 treaties ratified by the U.S. Congress and repeatedly reaffirmed by the Supreme Court and various Executive Orders.

Footnote: In Sept., 2001, tribes are meeting because sovereignty is being threatened.

-American Indian Content Standards, ORBIS Associates for Bureau of Indian Affairs.

❖ BACKGROUND
❖ MATERIALS
❖ ACTIVITIES
for
Language Arts-Based Units

THE ORAL TRADITION AND ORATORY

Indian people are known for having an oral tradition. Even though they sometimes utilized forms of writing, their main way of handing down history and stories was by telling such information to others. Indian people were also great orators. Although they usually used few words, their words sent powerful messages. Consider the following:

"Everything on earth has a purpose and every person a mission."- Mourning Dove, Salish

"I have seen that in any great undertaking it is not enough for a man to depend simply upon himself." – Lone Man, Lakota

"Your mother's the one that does everything for you. The Mother Earth does the same." – Lena Sooktis, Northern Cheyenne

"You must speak straight so that your words may go as sunlight into our hearts." – Cochise, Apache

"Somebody will always be looking at you as an example of how to behave. Don't let them down." – Karen Wynn, Yokuts

"Politeness goes far, yet costs nothing." – Seneca

"The more you know, the more you will trust and the less you will fear." – Medewiwin, Ojibway

"Live a quiet life and be kind to all, and listen to the advice of the old. People will respect you if yu do this." – Nodinens, Chippewa

"My children, as you travel along life's road never harm anyone, nor cause anyone to feel sad." – Winnebago

"Teach children what is right to do and they will live that way and get on well in the world." - Chippewa

"If everyone did something for somebody else, there wouldn't be anyone in need in the whole world." – Marlene Richard, Tuscarora

"Knowledge is like the wind… once obtaining it you can go anywhere." – Yellow Horse

"The man who preserves his selfhood is ever calm and unshaken by the storms of existence." – Ohiyesa

LITERATURE FOR THE ORAL TRADITION AND ORATORY UNIT –

A Natural Education: Native American Ideas and Thoughts by Stan Padilla (**Indian Author**), Book Pub. Co., 1994.

Words of Power: Voices from Indian America by Norbert Hill, Jr. (**Indian Author**), Fulcrum Pub., 1994.

Indian Oratory: Famous Speeches by Noted Indian Chieftains compiled by W. C. Vanderwerth, University of Oklahoma Press, 1989.

Women of the Native Struggle: Portraits and Testimony of Native American Women by Ronnie Farley, Orion, 1993.

In the Trail of the Wind: American Indian Poems and Ritual Orations ed. by John Bierhorst, Dell, 1975.

ACTIVITIES FOR UNIT –

1. Have the students read and/or hear about how the oral tradition is important, i.e. learning from elders and sharing stories, knowledge and thoughts to keep the culture alive. Discuss the appropriate use of language in various situations and the effects of cultural context on language use.

2. Have the students read some Indian oratorical statements and paraphrase them.

3. Have the students do research on those who made the statements, if known.

4. Have the students develop statements on topics they feel strongly about and present.

5. Encourage the students to present their oratory in their Native language.

5. Have the students hear about the tribe's oral tradition, including the mores for story telling from a tribal elder/storyteller and other tribal mores around listening and speaking.

6. Have students write a proposal to be presented to the tribal council or the culture committee outlining how the oral tradition can be preserved and strengthened.

8. Have the students include their writing in a writing portfolio system.

INDIAN STORIES

As a part of the oral tradition, Indian people told stories. Their stories often taught lessons to the young people. Grandparents were most often the storytellers. Some stories were very long and could not be told in one sitting. Stories were usually only told at certain times, mainly in the wintertime. Indian stories are often referred to as legends, stories coming down from the past. It is important to preserve the Indian stories and storytelling among Indian people.

"Legends are an important and integral part of the Native American culture. Legends are a vehicle for teaching young people lessons and proper behavior, maintaining and recording Indian community history and an oral preservation of traditional beliefs and values explaining natural phenomenon and teaching respect to the natural world. All Indian tribes have recognized the importance of preserving this oral tradition."
– Legends Across Indian Nations, ORBIS Associates, Washington, DC.

LITERATURE FOR INDIAN STORIES UNIT -

Mishomis Book: The Voice of the Ojibway by Edward Benton-Banai (**Indian Author**), Indian Country Communications, 1991.

Native American Animal Stories or Keepers of the Animals by Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Native American Stories or Keepers of the Earth by Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Native Plant Stories or Keepers of Life Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Keepers of the Night by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1994. **Many tribes**

When the Chenoo Howls by Joseph Bruchac (**Indian Author**), Walker Books.

American Indian Myths & Legends by Richard Erdoes & Alfonzo Ortiz (**Indian Author**), Pantheon, 1982.

Hoksila and the Red buffalo by Moses Nelson Big Crow (**Indian Author**), Tipi Press, 1991. **Lakota**

Tales of Ticasuk: **Eskimo** Legends and Stories by Emily Ivanoff Brown (**Indian Author**), University of Alaska Press.

Seneca Indian Stories by Leo Cooper, Ha-yen-doh-nees (**Indian Author**), Bowman.

The Snake That Lived in the Santa Cruz Mountains and Other **Ohlone** Stories by Linda Yamane (**Indian Author**), Oyate, 1998.

American Indian Stories by Gertrude Bonin, Zitkala-Sa (**Indian Author**), University of Nebraska Press, 1979. **Dakota**

Old Indian Legends by Gertrude Bonin, Zitkala-Sa (**Indian Author**), University of Nebraska Press, 1985. **Dakota**

Creation of a **California** Tribe by Lee Smith and Clifford E. Trafzer (**Indian Authors**), Sierra Oaks.

Earthmaker's Lodge: American Indian Folklore, Activities and Foods by Barrie Kavasch (**Indian Author**). **Many tribes**

Skywoman: Legends of the **Iroquois** by Joanne Shenandoah (**Indian Author**) and others, 1998.

Myths and Legends of the **Sioux** by Marie L. MacLaughlin, Tumbleweed Press.

Earth Lodge Tales from the Upper Missouri: Traditional Stories of the **Arikara, Hidatsa** and **Mandan**, Mary College.

Navajo Coyote Tales by William Morgan (**Indian Author**).

Stories of the **Sioux** by Luther Standing Bear (**Indian Author**), University of Nebraska.

Stories of the Metis by B. Sealey, Manitoba **Metis** Federation Press.

Two Old Women by Velma Wallis (**Indian Author**), Harper Perennial, 1993. **Athabascan**

The Bear-Walker and Other Stories, The Star-Man and Other Tales, Tales of the Anishinaubaek by Basil Johnston (**Indian Author**), Royal Ontario Museum. **Ojibwa**

Ojibway Tales by Basil H. Johnston (**Indian Author**), Bison, 1993.

The Story Catcher by Mari Sandoz, 1963. **Lakota**

Six **Micmac** Stories by Ruth Holmes Whitehead, Nova Scotia Museum, 1992.

Indian Legends from the **Northern Rockies** by Ella E. Clark, Univ, of Okla. Press.

The Sound of Flutes by Richard Erdoes, Pantheon, 1976. **Lakota**

Dakota Texts by Ella Cara Deloria (**Indian Author**), Dakota Press, 1992.

The Bear Who Stole the Chinook by Frances Fraser, Douglas & McIntyre, 1990. **Blackfeet**

Coyote Stories by Mourning Dove (**Indian Author**), University of Nebraska Press, 1990.

Stories That Make the World by Rodney Frey, University of Oklahoma Press, 1995. **Northwest**

Blackfeet Indian Stories by George Bird Grinnell, Applewood, 1913.

Myths and Traditions of the **Crow** Indians by Robert H. Lowie, University of Nebraska Press, 1993.

Lakota Myth by James R. Walker, University of Nebraska Press, 1983.

American Indian Legends by Zitkala-Sa (Gertrude Simmons Bonnin, **Indian Author**), University of Nebraska Press, 1985.

Tonweya and the Eagles and Other **Lakota** Indian Tales by Rosebud Yellow Robe (**Indian Author**), Dial, 1979.

Check your library or bookstores for other books of Indian legends, especially those of the local tribe(s).

ACTIVITIES FOR INDIAN STORIES UNIT-

1. Have the students read and discuss Indian stories, mainly from their own local tribe(s) or regions. Do they teach lessons? When are they to be told? Who compiled the stories? Discuss the effects of cultural contexts on communication.
2. Have the students verify the accuracy of the stories from local tribes by conferring with tribal elders, etc. There may be other versions that are more accepted by the local people.
3. If it is the appropriate time, have an elder(s) visit the classroom and tell Stories and/or talk about story telling.
4. Have the students create a booklet of tribal stories. Have them use the writing process so it will be as professional as possible.
5. Have the students keep their written work as part of a portfolio system.

POETRY BY INDIAN AUTHORS

Indian young people should know and read the poetry of Indian authors. Poetry provides a special way to communicate feelings and can provide a way for young people to connect with and recognize others' feelings and thoughts.

LITERATURE FOR POETRY BY INDIAN AUTHORS UNIT –

The Business of Fancy Dancing by Sherman Alexie (**Spokane/Coeur d'Alene**), Hanging Loose Press, 1992.

Old Shirts and New Skins by Sherman Alexie (**Spokane/Coeur d'Alene**), University of California Press, 1993.

At the helm of twilight by Anita Endrezze (**Yaqui**), Broken Moon Press, 1992.

Reinventing the Enemy's Language: Contemporary Native Women's Writing of Native America ed. by Joy Harjo (**Muscogee**) and Gloria Bird (**Spokane**).

Songs from This Earth on Turtle's Back ed. by Joseph Bruchac (**Abenaki**), Greenfield Review Press, 1983.

Dancing on the Rim of the World: Anthology of Northwest Native American Writing, University of Arizona Press, 1990.

Harper's Anthology of 20th Century Native American Poetry ed. by Duane Niatum (**Klallam**), Harper & Row, 1988.

No Borders by Joseph Bruchac (**Abenaki**).

In Mad Love and War by Joy Harjo (**Creek**), Wesleyan University Press, 1990.

A Breeze Swept Through by Luci Tapahonso (**Navajo**), University of Arizona Press, 1987.

S'aanii Dahataal/The Women Are Singing by Luci Tapahonso (**Navajo**), University of Arizona Press, 1993.

A Cheyenne Sketchbook: Selected Poems 1970-1991 by Lance Henson (**Southern Cheyenne**), Greenfield Review Press, 1992.

Full Moon on the Reservation by Gloria Bird (**Spokane**), Greenfield Review Press, 1994.

A Quick Brush of Wings by Mary Tallmountain (**Athabascan**), Freedom Voices.

Summer in the Spring by Gerald Vizenor (**Chippewa**), University of Oklahoma Press, 1993.

Riding the Earthboy 40 by James Welch (**Blackfeet/Gros Ventre**). Confluence Press. 1971.

Clans of Many Nations: Selected Poems 1969-1994 by Peter Blue Cloud (**Mohawk**), White Pine.

Durable Breath: Contemporary Native American Poetry by John E. Smelcer and D.L. Birchfield (**Choctaw/Chickasaw**), 1994.

Columbus Day: Poems, Drawings and Stories About American Indian Life and Death in the Nineteen Seventies by Jimmie Durham (**Cherokee**), West End Press, 1983.

Native North American Literary Companion by Joseph Bruchac (**Abenaki**) and Janet Witalec, Visable Ink, 1998.

Contemporary Native American Authors: A Biographical Dictionary, CRC Publishing Co., Eagle Rock Books. 800 268-2059

ACTIVITIES FOR POETRY BY INDIAN AUTHORS UNIT –

1. Have students read poetry selected by the teacher for all students to read. Students should understand the speaker, the meanings of words, the grammar and punctuation, and the organization of the total composition. Students should feel the actual sounds and rhythm of the poem's language and its appeal to their senses. Students should "experience" the poetry and understand that people respond differently to literature.

2. Have the students respond and reflect upon poetry by presenting a role play, journaling, or doing a media project.

3. Have students choose selections that they wish to read and prepare at least one reading and response to be presented to the class.

4. Have students report on the Indian poets they have read.

5. Have students do research to find poetry by local tribal members and develop a relationship/correspond with those poets.

6. Have students write their own poetry and publish it.

7. Have the students include their writing in a writing portfolio system.

SHORT STORIES BY INDIAN AUTHORS

Indian young people should know and read the work of Indian authors of short stories. A story presents us with a world of the author's imagination. The author combines people, places, events and ideas to create a unique, fictional world. In putting these parts together to form a story, the author wants to illustrate a truth – a generalization – about life. A good short story presents enough lifelike qualities to help us better understand ourselves and our world. A short story should be readable in one sitting. The author works with basic elements: plot, character, setting, point of view, and theme.

LITERATURE FOR SHORT STORIES BY INDIAN AUTHORS UNIT –

The Bleeding Man and Other Stories by Craig Kee Strete (**Indian Author**), Greenwillow, 1977.

The Hawk is Hungry and Other Stories by D'Arcy McNickle (**Salish**), University or Arizona Press, 1992.

The Power of Horses and Other Stories by Elizabeth Cook-Lynn (**Dakota**), Arcade, 1990.

That's What She Said: Contemporary Poetry and Fiction by Native American Women ed. by Rayna Green (**Cherokee**) Indiana University Press, 1984.

The Man To Send Rainclouds: Contemporary Stories by American Indians ed. by Kenneth Rosen, Vintage Books, 1975.

American Indian Literature: An Anthology by Alan R.Velie, University of Oklahoma Press, 1991.

Plains Native American Literature, Multiculture Literature Collection ed. by Virginia Seeley, Globe, 1993.

Native North American Literary Companion by Joseph Bruchac (**Abenaki**) and Janet Witalec, Visible Ink, 1998.

Talking Leaves: Contemporaty Native American Short Stories ed. by Craig Lesley, Laurel, 1991.

The Lone Ranger and Tonto Fistfight in Heaven by Sherman Alexie (**Spokane/Coeur d'Alene**), The Atlantic Monthly Press, 1993.

Turtle Meat and Other Stories by Joseph Bruchac (**Abenaki**), Holy Cow! Press, 1992.

Tribes by James Welch (**Blackfeet/Gros Ventre**) in Ploughshares, Spring, 1994.

Voice of the Turtle: American Indian Literature 1900-1970 ed. by Paula Gunn Allen (**Laguna/Sioux**), Ballantine, 1974.

One Good Story, That One by Thomas King (**Cherokee**), 1993.

Earth Power Coming: Short Fiction in Native American Literature ed. by Simon Ortiz (**Acoma Pueblo**), 1983.

Bead on an Anthill: A Lakota Childhood by Delphine Red Shirt (**Lakota**), 1998.

Men on the Moon: Collected Short Stories by Simon Ortiz (**Acoma Pueblo**), 1999.

Growing Up Native American: An Anthology ed. by Patricia Riley, Morrow, 1993.

The Sound of Rattles and Clappers: A Collection of New California Indian Writing ed. by Greg Sarris (**Coast Miwok**), 1994.

Food and Spirits by Beth Grant (**Mohawk**), 1991.

Achimoona ed. by Maria Campbell (**Metis**), Fifth House, 1992.

ACTIVITIES FOR SHORT STORIES BY INDIAN AUTHORS UNIT –

1. Have the students read short stories selected by the teacher. Let them know the purpose for the reading. Have them discuss the plot, characters, setting, point of view and theme. Have them predict. Have them determine if the story(ies) offer a generalization about life. Have them evaluate the stories and recognize that people respond differently to literature.

2. Have the students choose and read other short stories. Have them prepare reports about the stories they have chosen.

3. Have the students do research and report on the authors of the stories.

4. Have the students write short stories and have them published. Have them use writing and editing process. Have them exchange stories with students in other schools. Sell their book of short stories at tribal museums, casinos, etc.

5. Have the students research to find local short story authors and establish a relationship with them including having them visit the class.

6. Have the students include their writing in a writing portfolio system.

STUDENT WRITING

It is very important that Indian students become good writers. Many schools are trying harder to teach students to write well. There is a great need for Indian people to know how to write effectively. Tribal government workers, for example, acquire money and programs for the tribal members by writing proposals that must compete with others for funding. Some Indian young people may eventually make their living by writing; maybe they will be authors or news reporters and be able to tell the story of Indian people. All people need to be able to write well to function in society. This unit will highlight the published works of Indian students. Students might write poetry, short stories or essays or may capture historical information or stories from elders. Some schools informally publish their student's work and that is just as important and should be included and read by other students. Student's written work should be published regularly.

LITERATURE FOR STUDENT WRITING UNIT-

Courageous Spirits: Aboriginal Heroes of Our Children by Jo-ann Archibald, Val Friesen and Jeff Smith (**Indian Author**), Theytus, 1993. **Canada**

Giving: **Ojibwa** Stories and Legends, Children of Curve Lake Reserve, Waapoone, 1985.

When the Rain Sings: Poems by Young Native Americans by Lee Francis (**Indian Author**), Simon & Schuster, 1999.

Angwamas Minosewag **Anishinabeg**: Time of the Indian, students of the Red School House, Indian Country Communications, 1977.

Just Talking About Ourselves: Voices of Our Youth (Vols. 1, 2 & 3) by Marlena Dolan, Theytus, 1994.

Rising Voices: Writings of Young Native Americans by Arlene B. Hirschfelder (**Indian Author**) and Beverly Singer, Scribner, 1992.

It's Like My Heart Pounding: Imaginative Writing of American Indian Students by Mick Fedullo, Weber State College, 1990.

Touching Home: Stories, Essays & Poems by Tribal College Students, Tribal College Press.

Reclaiming the Vision, Past, Present, and Future: Native Voices for the Eighth Generation ed. by Lee Francis (**Laguna Pueblo**) and James Bruchac (**Abenaki**), Greenfield Review Press, 1996.

ACTIVITIES FOR STUDENT WRITING UNIT-

1. Have students read and respond to the works of other students from other places and/or classes.
2. Stress the use of a writing process such as: pre-writing, first draft, peer conference, revise, edit, publish, and share. Let them know that authors and students who have their works published follow this, or a similar, process.
3. Have students write poetry, short stories and essays.
4. Have students interview elders and gather historical information or stories.
5. Have the students publish their work including all of the steps necessary to print and sell them. Have them figure the cost of publishing their work in a booklet(s), how much they would have to charge for them, related costs.
6. Assign students various tasks, editing, illustrating, marketing, selling, etc.
7. Enter students' works in writing contests or in other opportunities to be published.
8. Have the students include their work in a writing portfolio system.

NOVELS BY INDIAN AUTHORS

Indian young people should know and read the work of Indian novelists. Because of its length, a novel can picture life with all of its richness, complexity, and contradiction. A novel uses the same elements as a short story: plot, character, setting, point of view, and theme; but the greater length of the novel allows novelists to deal with more complex aspects of these elements.

LITERATURE FOR NOVELS BY INDIAN AUTHORS UNIT –

Indian Killer by Sherman Alexie (**Spokane/Coeur d'Alene**), Atlantic Monthly Press, 1996.

Reservation Blues by Sherman Alexie (**Spokane/Coeur d'Alene**), Warner Books, 1996.

The Owl's Song by Janet Campbell Hale (**Coeur d'Alene**), Bantam Books, 1991.

Jailing of Cecelia Capture by Janet Campbell Hale (**Coeur d' Alene**), Random House, 1985.

The Surrounded by D'Arcy McNickle (**Salish**), University of New Mexico Press, 1936.

House Made of Dawn by N. Scott Momaday (**Kiowa**), New American Library, 1968.

Cogawea, the Half-Blood by Mourning Dove (**Okanagan/Colville**), University of Nebraska Press, 1981.

The Sharpest Sight by Louis Owens (**Choctaw/Cherokee**), University of Oklahoma Press, 1992.

Wolfsong by Louis Owens (**Choctaw/Cherokee**), West End Press, 1991.

My Name is Seepeetza by Shirley Sterling (**Salish**), Groundwood Press, 1992.

Medicine River by Thomas King (**Cherokee**), Viking, 1990.

Green Grass, Running Water by Thomas King (**Cherokee**), Houghton Mifflin, 1993.

Green March Moons by Mary TallMountain (**Athabascan**), New Seed Press, 1987.

The Grass Dancer by Susan Power (**Sioux**), Berkeley Books, 1997.

Ceremony by Leslie Marmon Silko (**Laguna Pueblo**), Signet, 1977.

April Raintree by Beatrice Culleton (**Metis**), Pemmican, 1994.

A Yellow Raft in Blue Water by Michael Dorris (**Modoc**), Henry Holt, 1987.

Love Medicine by Louise Erdrich (**Chippewa**), Holt, Rinehart & Winston, 1984.

Tracks by Louise Erdrich (**Chippewa**), Henry Holt, 1988.

Dead Voice: Natural Agonies in the New World by Gerald Vizenor (**Chippewa**), University of Oklahoma Press, 1992.

The Death or Jim Loney by James Welch (**Blackfeet/Gros Ventre**), Penguin, 1979.

Winter in the Blood by James Welch (**Blackfeet/Gros Ventre**), Penguin, 1987.

Indian Lawyer by James Welch (**Blackfeet/Gros Ventre**), Penguin, 1990.

Sundown by John Joseph Mathews (**Osage**), University of Oklahoma Press, 1988.

Silent Words by Ruby Slipperjack (**Ojibway**), Fifth House, 1992.

ACTIVITIES FOR NOVELS BY INDIAN AUTHORS UNIT –

1. Have the students read a novel together. Utilize literature circle strategies. What do they already know about the book and the topic? Have them discuss the plot, character, setting, point of view, and theme. Have them respond.

2. Have the students select novels to read. Have them prepare a report to be presented to the rest of the class. Have them explain the purpose of the reading, their response and discuss the plot, character, setting, point of view, and theme.

3. Have the students do research on Indian authors and report. The book Contemporary Native American Authors: A Biographical Dictionary should include most Indian authors. Books including works of Indian authors should have some information on them.

4. Have the students study the book review section of a newspaper. Then have them write book reviews on the novels they have read for the newspaper.

5. Have the students encourage family members to read the novels they have read and lead a discussion on the book(s) with the family member(s).

6. Have the students include their written work in a portfolio system.

DRAMA BY INDIAN PLAYWRIGHTS

Indian young people should know and read the work of Indian playwrights. There are fewer Indian writers in this genre than in the others. Drama consists of stories that are written to be performed for an audience. The playwright writes two things: dialogue that the actors speak and stage directions that give instructions to the various people involved in putting on the play, including the actors. The actual putting on of the play is called staging and it involves scenery, costumes, lighting, and props – as well as the activities of the actors. Drama as a form of literature dates back to the ancient Greeks and seems to have had its origins in religious ritual.

LITERATURE FOR DRAMA BY INDIAN PLAYWRIGHTS UNIT -

New Native American Drama: Three Plays by Hanay Geiogamah (**Kiowa**), University of Oklahoma Press, 1980.

Toronto at Dreamer's Rock/Education Is Our Right by Drew Hayden Taylor (**Ojibway**), Fifth House, 1990.

The Rez Sisters by Thompson Highway (**Cree**), Fifth House, 1988.

Smoke Signals by Sherman Alexie (**Spokane/Coeur d'Alene**), 1998.

ACTIVITIES FOR DRAMA BY INDIAN PLAYWRIGHTS UNIT -

1. Have the students read a play or screenplay together.
2. Have the students do research to learn about the author.
3. Have the students act out a portion or all of the play.
4. Have the students present a play to a community audience. Give roles and responsibilities to each class member.
5. Have the students keep a journal of their experiences and feelings in regard to the play.
6. Have the students keep their written work as part of a portfolio system.

ESSAYS BY INDIAN AUTHORS

Indian young people should know and read the essays of Indian authors. An essay is a moderately brief nonfiction work that deals with a particular topic. The form dates back to the French philosopher Montaigne (1533-1592), and the word essay comes from the French *essai*, which means "an attempt." Essays may be classified as formal or informal A formal essay is a carefully structured attempt to instruct or persuade. It has a serious tone, presents its argument logically, and generally refrains from personal references. An informal essay is an attempt to entertain the reader while exploring a topic. Its tone is light, its structure somewhat sprawling, and it may make personal references. In fact, informal essays are sometimes called personal essays.

LITERATURE FOR ESSAYS BY INDIAN AUTHORS UNIT -

Growing Up Native American: An Anthology ed. by Patricia Riley, Morrow, 1993.

American Indian Stories by Zitkala-Sa (Gertrude Simmons Bonnin, **Yankton Sioux**), University of Nebraska Press, 1985.

Notes from Indian Country by Tim Giago (**Oglala Sioux**), State Publishing, 1984.

Dwellings: A Spiritual History of the Living World by Linda Hogan (**Chickasaw**), 1995,

Speaking for the Generations: Native Writers on Writing ed. by Simon Ortiz (**Acoma Pueblo**), 1998.

Family Matters, Tribal Affairs by Carter Revard (**Osage**), 1998.

Funny, You Don't Look Like One: Observations from a Blue-Eyed Ojibway by Drew Hayden Taylor (**Ojibway**), 1996.

Works by Vine Deloria, Jr. (**Dakota**)

ACTIVITIES FOR ESSAYS BY INDIAN AUTHORS UNIT –

1. Have the students read essays selected by the teacher. Discuss the content of the essays and the form of an essay.

2. Have the students select essays to read and respond to in writing.

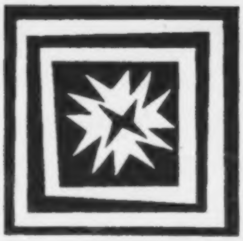
3. Have the students find essays in the newspaper. Invite a newspaper writer, editor to visit the class.

4. Have the students write essays about something they feel strongly about and have some of them published alone or with other types of student writing.

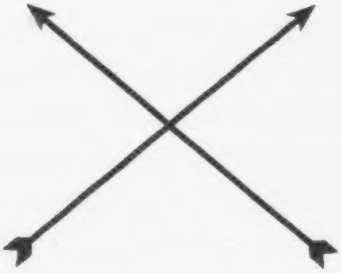
5. Have the students keep their writing as part of a portfolio system.

SOME AMERICAN INDIAN/ALASKA NATIVE AUTHORS

Sherman Alexie (Spokane/Coeur d'Alene)
Annette Arkeketa West (Otoe_Creek)
Jeanette Armstrong (Okanagan)
Marilou Awiakta (Cherokee)
Moses Nelson Big Crow (Lakota)
Duane Big Eagle (Osage-Sioux)
Gloria Bird (Spokane)
Peter Blue Cloud (Mohawk)
Beth Brant (Mohawk)
Joseph Bruchac (Abenaki)
Diane Burns (Anishinabe)
Barney Bush (Shawnee-Cayuga)
Maria Campbell (Metis)
Janet Campbell Hale (Coeur D'Alene)
Gladys Cardiff (Cherokee)
Eileen Charbonneau (Cherokee)
Elizabeth Cook-Lynn (Dakota)
Beatrice Culleton (Metis)
Nora Dauenhauer (Tlingit)
Charlotte de Clue (Osage)
Ella Cara Deloria (Dakota)
Vine Deloria, Jr. (Dakota)
Michael Dorris (Modoc)
Virginia Driving Hawk Sneve (Lakota)
Debra Earling (Flathead)
Ed Edmo (Shoshone-Bannock)
Anita Endrezze (Yaqui)
Louise Erdrich (Ojibwa)
Lee Francis (Laguna Pueblo)
Tina Freeman-Villalobos (Modoc)
Diane Glancy (Cherokee)
Rayna Green (Cherokee)
Paula Gunn Allen (Pueblo- Sioux)
Ruth Ann Hall (Hidatsa)
Joy Harjo (Muscogee)
Lance Henson (Cheyenne)
Roberta Hill Whiteman (Oneida)
Shirley Hill Witt (Mohawk)
Linda Hogan (Chickasaw)
Beverly Hungry Wolf (Blackfeet)
Roger Jack (Colville)
Rita Joe (Micmac)
Maurice Kenny (Mohawk)
Thomas King (Cherokee)
Michael Lacapa (Apache/Hopi)
Carol Lee Sanchez (Laguna/Sioux)
D'Arcy McNickle (Salish)
Leslie Marmon Silko (Laguna)
Tiffany Midge (Standing Rock)
Judith Minty (Mohawk)
N. Scott Momaday (Kiowa)
Judith Volborth (Apache/Comanche)
Duane Niatum (S'Kallam)
Jim Northrup (Anishinabe)
Simon Ortiz (Acoma Pueblo)
William S. Penn (Nez Perce)
Russell Peters (Wampanoag)
Susan K. Power (Standing Rock)
Juane Quick-to-See Smith (Salish)
Carter Revard (Osage)
Mickey Roberts (Nooksack)
Wendy Rose (Hopi-Miwok)
Gayle Ross (Cherokee)
Greg Sarris (Pomo-Miwok)
Cheryl Savageau (Abenaki/Metis)
Kathleen Shaye Hill (Klamath)
Ruby Slipperjack (Ojibway)
Shirley Sterling (Salish)
Virginia Stroud (Cherokee)
Mary TallMountain (Athabascan)
Luci Tapahonso (Navajo)
Clifford Trafzer (Wyandott)
Paula Underwood Spencer (Oneida)
Richard Van Camp (Dogrib)
Gerald Vizenor (Ojibwa)
Anna Lee Walters (Pawnee/Otoe)
Rupert Weeks (Shoshone)
James Welch (Blackfeet/GrosVentre)
Baje Whitethorne (Navajo)
Darryl Babe Wilson (Pitt River)
Phyllis Wolf (Assiniboine/Ojibway)
Elizabeth Woody (Wasco-Navajo)
Ray Young Bear (Mesquakie)
Ofelia Zepeda (Tohono O'odham)



Language Arts & Math Standards Addressed in Creating Sacred Places for Students in Grades 9-12



LANGUAGE ARTS STANDARDS TO BE ADDRESSED IN CREATING SACRED PLACES CURRICULUM –

Standard – Gathers information effectively through reading, listening and viewing
Benchmarks –
Synthesizes a variety of types of visual information including pictures and symbols
Effectively uses indices, appendices, glossaries and table of contents
Determines figurative, idiomatic and technical meanings of terms through context
Determines meaning of abbreviations and acronyms from context
Uses cross referencing while gathering information
Scans passage to determine whether a text contains relevant information
Determines meaning of codes and symbols from context
Understands mathematical notation presented in writing
Understands that reading, viewing and listening are gradual processes of constructing meaning and makes revisions of initial understandings
Uses questions as a way of understanding a text
Uses discussions with peers as a way of understanding information
Accurately illustrates information that others have presented
Writes basic description of events to record information
Summarizes dialogues for the purpose of collecting information
Represents key ideas and supporting detail in outline form
Appraises a written communication for its clarity

Standard – Reads and responds to literature
Benchmarks –
Relates personal response to the text with that intended by the author
Recognizes when and why the student is responding to the text
Understands that reactions to a text will change throughout the text
Traces the origins of own responses to literature
Voluntarily shares responses to texts with peers
Understands that a single text will elicit a wide variety of responses, each of which is valid from a personal, subjective perspective
Understands that readers have the right and even the responsibility to bring their own values to bear as they respond to a text

Standard – Gathers information from technical documents, graphs, charts and tables
Benchmarks –
Accurately interprets information from a data matrix
Detects inconsistencies in a data matrix
Identifies main theme and supporting detail in technical documents
Distinguishes between relevant and irrelevant information in technical documents
Follows basic linear paths in organizational charts
Scans completed forms to identify specific information
Identifies major sections in schematic designs

Identifies parts from a key or legend
Uses the linear path of a flow chart to provide visual and textual directions to a procedure
Isolates a problem component in a schematic diagram and traces it to the cause of the problem
Interprets symbols in a flow chart to indicate flow of direction, text points, components and diagrammatic decision points
Identifies details, labels, numbers and parts from technical illustrations and pictures
Interprets a drawing of a cross section for assembly or disassembly
Obtains a factor specification from a two-column chart to find information
Obtains a factor specification from an intersection of row by column in a table or chart
Uses tables and charts to identify malfunctions

Standard - Communicates ideas and information in writing
Benchmarks –
Enters information into basic forms correctly
Evaluates a written communication for its clarity
Writes technical reports
Expresses ideas about mathematics in writing
Uses personal response to text as a basis for writing
Writes effectively for highly public audiences

Standard – Understands and applies basic principles of language use
Benchmarks –
Understands the influence of gender on language use
Carries out investigations of unanswered questions regarding language
Engages in public speaking around issues of personal concern
Understands the effect of specific aspects of culture on language use
Compares form, meaning and value of different kinds of language
Understands the political implications of using different forms of language

--McREL, The Systematic Identification and Articulation of Content Standards and Benchmarks

AMERICAN INDIAN LANGUAGE AND LITERACY CONTENT STANDARDS TO BE ADDRESSED IN CREATING SACRED PLACES CURRICULUM

Indian students should show growth and increasing sophistication in:

Understanding and using forms and features of language that vary within and across individual speakers, diverse cultural communities, and different situations.

Developing and applying Native language literacies while developing/applying English literacies.

Understanding the effects of cultural contexts, particularly of their tribe, on what students read, write, hear, say, and view.

Listening, speaking, writing, and responding respectfully but critically in large and small groups.

Becoming aware of, monitoring, reflecting on, and articulating their own processes and strategies in reading, writing, listening, and speaking.

Developing oral communication skills to perpetuate the American Indian oral tradition.

Analyzing, evaluating, and assessing what they read, write, hear, say and view – e.g., comparing American Indian and non-Indian perspectives in historical records.

Reading popular and classical literature from diverse cultures and times, especially American Indian literature, for a variety of purposes and in a variety of genres, and becoming aware of the ways readers and writers are influenced by personal, social, cultural, and historical contexts.

Developing multiple strategies to appreciate, interpret, and critique various types of literature and of the print and nonprint text, including student work – e.g., evaluating literature with Indian themes by non-Indian writers in contrast with literature by Indian writers.

Recognizing, reflecting on, and articulating their participation in the aesthetic dimensions of literature.

Writing for a variety of real world purposes and audiences and in a variety of genres, including those which allow them to communicate well in their own communities.

Learning, understanding, and using formal conventions of English.

Understanding the origin and structure of language to become more proficient users of language.

Using a range of technological forms of communication and understanding and evaluating critically the conventions, demands, opportunities, and responsibilities of technologically based discourse.

Exploring ideas and feelings imaginatively through a variety of creative modes, e.g. journals, story telling, drama, and media projects.

Defining, synthesizing, hypothesizing, drawing conclusions, and evaluating within the use of multiple resources.

Building upon Native language and experience in school learning.

- American Indian Content Standards developed for the Bureau of Indian Affairs, Office of Indian Education Programs by ORBIS Associates, Washington, DC.

MATHEMATICS STANDARDS TO BE ADDRESSED IN CREATING SACRED PLACES CURRICULUM

Standard – Effectively uses a variety of strategies within the problem solving process
Benchmarks –
Designs and carries out statistical experiments
Uses linear programming to solve problems
Classifies problem solving strategies or problem types by underlying general characteristics
Represents problems using algebraic functions and graphs of those functions
Uses difference equations to solve problems

Standard – Understands and applies basic and advanced properties of numbers
Benchmarks –
Understands characteristics of the real number system and its subsystems
Understands the relationship between roots and exponents
Solves problems involving roots and exponents
Models numbers using three-dimensional regions
Compares and contrasts elements of the real number system

Standard – Uses basic and advanced procedures while performing the process of computation
Benchmarks –
Adds and subtracts algebraic expressions
Analyzes rounding errors via calculator or computer

Standard – Understands and applies basic and advanced methods of measurement
Benchmarks –
Understands the basic characteristics of the concept of capacity and how it is measured
Has a basic understanding of the concept of velocity and how it is measured
Has a basic understanding of the concept of acceleration and how it is measured
Determines precision and accuracy of measurements
Analyzes absolute and relative errors in measurement

Standard – Understands and applies basic and advanced concepts of geometry
Benchmarks –
Understands the basic features of vectors
Understands the relationship between parallelism and perpendicularity
Understands the characteristics and uses of Pythagorean relationships
Performs synthetic translations/rotations/reflections of basic shapes
Solves problems involving vectors
Solves problems involving the Pythagorean relationship
Analyzes the intersection of three-dimensional figures
Classifies figures based on congruence

Standard – Understands and applies basic and advanced concepts of data analysis and distributions
Benchmarks –
Understands the basic features of data sets (matrices)
Understands the basic features of the standard normal distribution
Understands the basic measures of dispersion (i.e., standard deviation, variance)
Understands the basic features of outliers and procedures to deal with them
Represents data using stem and leaf plots and scatter plots
Solves problems using data matrices

Standard – Understands and applies basic and advanced concepts of probability and statistics
Benchmarks –
Has a basic understanding of the concept of random variables
Understands the similarities and differences between joint and conditional probability
Has a basic understanding of the concept of independence
Understands the basic features of a statistic
Determines probability through trees, formulas, permutations and counting
Solves problems involving conditional probability and joint probability
Compare experimental results with mathematical expectations of probabilities

Standard – Understands and applies basic and advanced properties of functions and algebra
Benchmarks –
Has a basic understanding of the concept of a function
Understands characteristics and uses of basic trigonometric functions
Has a basic understanding of the concept of inequalities
Has a basic understanding of parameters and their effects on curve shape
Understands that a correlation measures the linear relationship between two sets of data
Has a basic understanding of polynomial equations
Understands basic trigonometry functions
Solves problems involving polar coordinates
Determines the maximum and minimum points on a graph
Fits a line to a set of points
Fits a curve to a set of points

--McREL, The Systematic Identification and Articulation of Content Standards and Benchmarks

AMERICAN INDIAN MATHEMATICS STANDARDS TO BE ADDRESSED IN CREATING SACRED PLACES CURRICULUM

Mathematics as Problem Solving

Indian students should be able to apply integrated mathematical problem-solving strategies, within the context of problems related to tribal community activities, school situations, classroom projects, and group participants'shared interests.

Indian students should be able to apply the process of mathematics modeling to real-world problem situations, such as tribal road-building projects, or quantifying data on water or other tribal resources.

Mathematics as Communication

Indian students should be able to appreciate the economy, power, and elegance of mathematical notation and its role in the development of mathematical ideas applied to tribal situations.

Indian students should realize one's own contribution to the tribe as it relates to promoting the local tribe's economic and technological growth.

Indian students should understand the power of mathematical representation to preserve tribal human and natural resources.

Mathematics as Reasoning

Indian students should make and text conjectures in context of issues related to their own tribal community.

Indian students should formulate counterexamples (comparing to other tribes).

Indian students should judge the validity of arguments (don't avoid moral dilemmas.)

Indian students should construct simple valid arguments (link to positions of various members in a community).

Mathematical Connections

Indian students should be able to use and value the connections among mathematical topics (link to study of tribal kinship systems).

Indian students should be able to use and value the connections between mathematics and other disciplines. Students should find mathematics in various disciplines with a connection to American Indian topics, such as social studies, tribal history, literature/art/music, tribal language and ethnosciences.

Algebra

Indian students should represent situations (germane to particular tribe or community) that involve variable quantities with expressions, equations, inequalities, and matrices.

Functions

Indian students should be able to model real-world phenomena with a variety of functions and represent and analyze relationships using tables, verbal rules, equations, and graphs, such as in the growth of tribal gross national product or individual incomes as a function of tribal economic ventures.

Geometry from a Synthetic Perspective

Indian students should be able to interpret and draw three-dimensional objects of American Indian cultural nature, using appropriate tools including computers.

Indian students should be able to classify figures in terms of congruence and similarity and apply these relationships (include opportunities for students to identify their own findings from local tribal/intertribal experiences).

Geometry from an Algebraic Perspective

Indian students should be able to identify congruent and similar figures using transformations (relating Indian beadwork designs to Pascal's Triangle).

Statistics

Indian students should be able to construct and draw inferences from charts, tables, and graphs that summarize data from real-world situations, such as tribal/intertribal newspapers or reports and advertising related to Indian communities.

Indian students should be able to understand and apply measures of central tendency, variability, and correlation in statistical data related to their tribe.

Indian students should be able to design a statistical experiment to study a tribally-related problem, conduct the experiment, and interpret and communicate the outcomes (to show as "whole project" to parents, public, use presentation software).

NOTES:

WHERE TO GET BOOKS

North American Native Authors Catalog, Greenfield Review Press, P.O. Box 308, Greenfield Center, New York 12833 (518) 583-1440 http://nativeauthors.com

Indian Books Catalog, Four Winds Indian Books, P.O. Box 544, York, NE 68467-0544 (402) 362-5654 http://www.fourwindsINDIANbooks.com

Amazon.com Bookstore and bookcenter@nativeweb.org All selections are linked directly to Amazon.com bookstore so that you may purchase them online at a discount.

Prairie Edge Book and Music List, Prairie Edge, 6th & Main, Rapid City, SD 57701 (800) 541-2388 prairie@rapidnet.com www.prairieedge.com

Native American Catalog, Book Publishing Company, P.O. Box 99, Summertown, TN 38483 (931) 964-3571 bookpubl@usit.net

The Native Book Centre, 150 York Hill Blvd., Thornhill, Ontario, Canada L4J 2P6 (905) 881-7804 http://www.9to5.com/9to5/NBC/

Medicine Root Inc., Native Earth Products of North America, P.O. Box 353, Louisville, CO 80027 (303) 661-9819 Fax (303) 664-5139

Pemmican Publications, Unit #2 – 1635 Burrows Ave., Winnepeg, Manitoba R2X 0T1 Canada (204) 589-6346 pemmican@fox.nstn.ca http://fox.nstn.ca/~pemmican

Clear Light Distribution, 823 Don Diego, Santa Fe, NM 87501 (800) 253-2747 www.clearllightbooks,com

Tipi Press, St. Joseph's Indian School, Chamberlain, SD 57326 (800) 229-5684

Lakota Books, P.O. Box 140, Kendall Park, NJ 08824 Fax 908 940-9429

Oyate Catalog, 2702 Mathews Street, Berkeley, CA 94702 (510) 848-6700 fax: (510) 848 4815 oyate@aoyate.org www.oyate.org

REVIEWING BOOKS/MATERIALS

Won in the Classroom, Guidelines for the Selection of Culturally Appropriate Materials, Indian Community School of Milwaukee, Inc. (414) 345-3040 www.ics-milw.org

Through Indian Eyes: The Native Experience in Books for Children by Beverly Slapin and Doris Seale, University of California, 1998. Oyate, 2702 Mathews St., Berkeley, CA 94702

TEACHER RESOURCES

Earth's Caretakers and Signs of Tradition: Native American Lessons, Math and Science Teachers for Reservation Schools (MASTERS) Project, University of Kansas, 1993 & 1994. (785) 864-4435 jnewland@ukans.edu

Native Science, Natural Laws of Interdependence by Gregory Cajete, Clear Light Pub., 2000.

Ignite the Sparkle: A Native American Science Education Curriculum Model by Gregory Cajete, Kavaki Press, Skyland, NC, 1999.

Indian Country: A History of Native People in America by Karen D. Harvey and Lisa D. Harjo, North American Press, 350 Indiana Street, Suite 350, Golden, CO 80401, 1994.

American Indian Citizenship in Balance: A Two Week Curriculum Unit, Grades 9-12, Close Up Foundation, Alexandria, VA (800) 256-7387.

Roots and Branches: A Resource of Native American Literature – Themes, Lessons and Bibliographies by Dorothea M. Susag, National Council of Teachers of English, 1998.

Light of the Feather: A Teacher's Journey into Native American Classrooms and Culture by Mick Fedullo, Wm Morrow, 1992.

Reclaiming the Vision – Past, Present and Future: Native Voices for the Eighth Generation, Greenfield Review Press. Includes exercises to generate work from student writers. (505) 584-1728

ORGANIZATIONS AND PROJECTS

American Indian Science and Engineering Society, P.O. Box 9828, Albuquerque, NM 87119 Publishes Winds of Change Magazine. (505) 765-1052 www.aises.org

Science Through Native American Eyes, Cradleboard Teaching Project, Nihewan Foundation for American Indian Education founded by Buffy St. Marie. Interactive Multimedia CD Rom for grades 5-adult. www.cradleboard.org

D'Arcy McNickle Center for the History of the American Indian,The Newberry Library, Chicago, Summer Institutes for Secondary and Tribal College Teachers on Indian Literature. 312 943-9090

Wordcraft Circle of Native Writers and Storytellers publishes Moccasin Telegraph newsletter, 9 East Burnam Road, Columbia, MO 65203

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